THE

VETERINARY JOURNAL

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Editorials.

TO OUR READERS.

WE take this opportunity of wishing all our readers, at home and abroad, a very prosperous New Year, and at the same time of thanking all our contributors for their assistance during the past year. From a scientific aspect, we consider that the VETERINARY JOURNAL of the past year has excelled itself. Our entreaties for clinical reports have been very generously responded to, and yet we dare to hope for a still more generous response during the present year. We have also gratefully received suggestions from our readers, and have been able to adopt some of them. The most recent suggestion we have received is that we should devote a little space to veterinary agricultural matters, and so from time to time we hope to present to our readers original articles and abstracts of recent work on such matters, which should be specially useful to our *confrères* practising in agricultural districts. We shall gladly welcome other suggestions from our readers likely to increase the sphere of usefulness of the Journal. Many of our supporters have promised reports of their unusual cases and the results of treatment, and we trust they will adhere to their promises, whether the results have been favourable or otherwise; for we learn quite as much, and often more, from our failures as our successes. Moreover, as one of our contemporaries has said, "the experience of any one practitioner is too limited as a basis for forming many opinions. It is the collective experience which provides the really valuable premises on which practice and success depend." That being the case, we ask our readers not to be backward in recording failures of any particular line of treatment that has been much vaunted, nor to refrain from

recording success because a similar success has already been recorded. It is "collective experience" that is wanted.

W.

INTERTRANSMISSIBLE HUMAN AND ANIMAL TRYPANOSOMIASES.

It would be difficult to over-estimate the enormous importance of the results of investigation recently recorded by Colonel Bruce and others in a paper read before the Royal Society, and which we hope to reproduce in our next issue. Bruce and his co-workers have been able to prove conclusively that cattle may act as a reservoir of the virus of sleeping-sickness. They have shown that cattle are susceptible to the *Trypanosoma gambiense,* that they can be naturally or artificially infected by means of flies (*Glossina palpalis*), that the virus can be conveyed by means of the flies from affected to healthy cattle, and, moreover, that some cattle living in the fly area actually do carry the virus of sleeping-sickness. These facts certainly bring the study of sleeping-sickness into the domain of the veterinarian.

Then hard upon the announcement of Bruce comes the original communication from Mr. Bevan, which we publish in this issue, concerning another trypanosome which is transmissible by inoculation into sheep. It is very interesting to note that the trypanosome referred to by Bevan was obtained from a human subject, and has been identified as *T. vivax.* This trypanosome is known as causing disease in cattle, sheep, and goats, in the Cameroons (German West Africa), but we are unaware of its having been previously found affecting human beings.

These reports extend the already wide field for investigation in which medical men and veterinary surgeons should work together, and we confidently look forward to a great increase in our knowledge concerning these diseases during the present year.

W.

MR. R. C. TRIGGER AND MR. R. E. L. PENHALE.

The position of Mayor of a Borough is one of the highest honours the citizens of a town can confer, and that, at the last change of rulers over municipal affairs, two towns should have selected members of our profession to occupy the position, especially during such an important year as the present, is a fact of which we may be

legitimately proud. Many of our members are doing good work on City and Borough Councils, and it would be a good thing for the country if the numbers were greater; for their advice on very many matters affecting Public Health is very necessary and could not be given in a better cause, especially on sanitary questions affecting meat and milk.

Mr. Trigger and Mr. Penhale are both busily engaged in large practices, and that they have found time to devote to Municipal affairs speaks volumes for their industry and broad-minded spheres of thought. Both are well known in the profession, and the opinion of each is much sought after both by their professional brethren and by a very large circle of clients.

Mr. Trigger has already received the highest confidence of the veterinary profession, having been elected as President of the Royal College of Veterinary Surgeons in 1897; and, amongst other positions too numerous to mention in detail, he has for more than twenty years been a leading Member of the Council of the Governing Body, also President of the National Veterinary Association, and President of the Midland Counties Veterinary Society. By the latter Society he was recently entertained as an honoured guest in commemoration of the fact that he had served the interests of the profession so loyally and well. A pupil of the late Mr. Cartwright of Wolverhampton, Mr. Trigger entered the profession at an early age, graduating from the London College in 1870. He then settled down in Newcastle-under-Lyme, where his ability and enthusiasm soon built up a very large consulting and general practice. As in the case of his Mayoral colleague, Mr. Penhale, the Board of Agriculture has secured his services as Veterinary Inspector and the value of his help and advice has been manifested in many outbreaks of disease.

Mr. Richard Penhale can safely be said to be one of the most popular men in North Devon. Popular alike with his profession and his fellow townsmen, his election to the Mayoral chair was not a matter of much difficulty, and his lengthy service on the town council has given him every opportunity to become fitted for the duties of the post. Born of yeoman stock, he inherited from his father a natural love for animals, and the Penhale family have given several hostages to the veterinary profession. The Borough of Torrington is a very ancient one, dating back from the reign of Queen Mary. The election to the office of chief magistrate is one of which Mr. Penhale may justifiably be proud.

That these two towns, the one in Staffordshire and the other in Devon, the citizens of which are engaged in totally opposite pursuits, will each have a level-headed counsellor to guide their affairs through the forthcoming year is a matter on which they may congratulate themselves in their respective selections, and we of the veterinary profession, in our turn, congratulate our colleagues.

General Articles.

A REPORT UPON 112 HORSES SATISFACTORILY TREATED BY THE NEW OPERATION FOR "ROARING" OR "WHISTLING."

By FREDERICK HOBDAY, F.R.C.V.S., F.R.S.E.

(Formerly Professor in the Royal Veterinary College, London), Kensington, W.

In the Veterinary Journal for January last (1910) I published an account of the ventricle stripping operation for "roaring" as described to me by Dr. Williams, the Professor of Surgery in the Veterinary Faculty of Cornell University, U.S.A.

On September 10, 1909, Dr. Williams came over to England at my request, and very generously gave a practical demonstration of the technique of his method of operating before a number of veterinary surgeons, the patients operated upon being two hunters belonging to clients of mine.

The animals passed through the ordeal satisfactorily, and were returned to their respective owners on October 10. Since then I have, in consultation with a number of members of the profession (to whom, especially Messrs. John Coleman, Sutton, Livock, D. Dudgeon, Manton, Grasby, Hazelton, Jagger, Healy and Ryan, I am indebted for the trouble they have taken in assisting me to compile statistics), operated upon nearly 250 cases (a number of which are still awaiting till sufficiently healed to be tested), and I propose in the present article to select and trace up to date 112 of them in which it can fairly be stated that the results are satisfactory. By the word "satisfactory" I mean satisfactory in the eyes of the owner and, usually, of his veterinary surgeon too. Some have even passed a veterinary test for soundness in wind, in others the word of the owner has been taken that the horse is now useful and able to work without distress; whereas before he was (in many cases) a useless beast for the purpose required.

In America the various operations for the relief of roaring have in recent years received a good deal of attention and the names of Liautard, Williams, Merrilat, Harger, and others have done much experimental and observation work on the subject.

In England, some years ago, Fleming, Axe, Fred Smith, Raymond, and various others attempted certain surgical methods, but soon dropped them as useless; and in France such master surgeons as Cadiot and

Bouley have devoted much time and thought to endeavouring to effect a cure.

In Germany Möller, and prior to him the two Günthers; in Italy, Bossi, and in Sweden Stockfleth, have all been workers at it at one time or another, but apparently no one has been able to demonstrate "up to the hilt" that any one method of surgical interference would command success in every case.

I do not pretend to be able to do this at present, as it is only fifteen months since I commenced my statistics, and I intend to wait fully two years before reporting absolutely definitely, but I do think a sufficient number are now under close observation (and that some have been done a sufficiently long time) to enable me to give to the profession some idea as to whether the ventricle stripping operation is of value or not. My opinion is that it is.

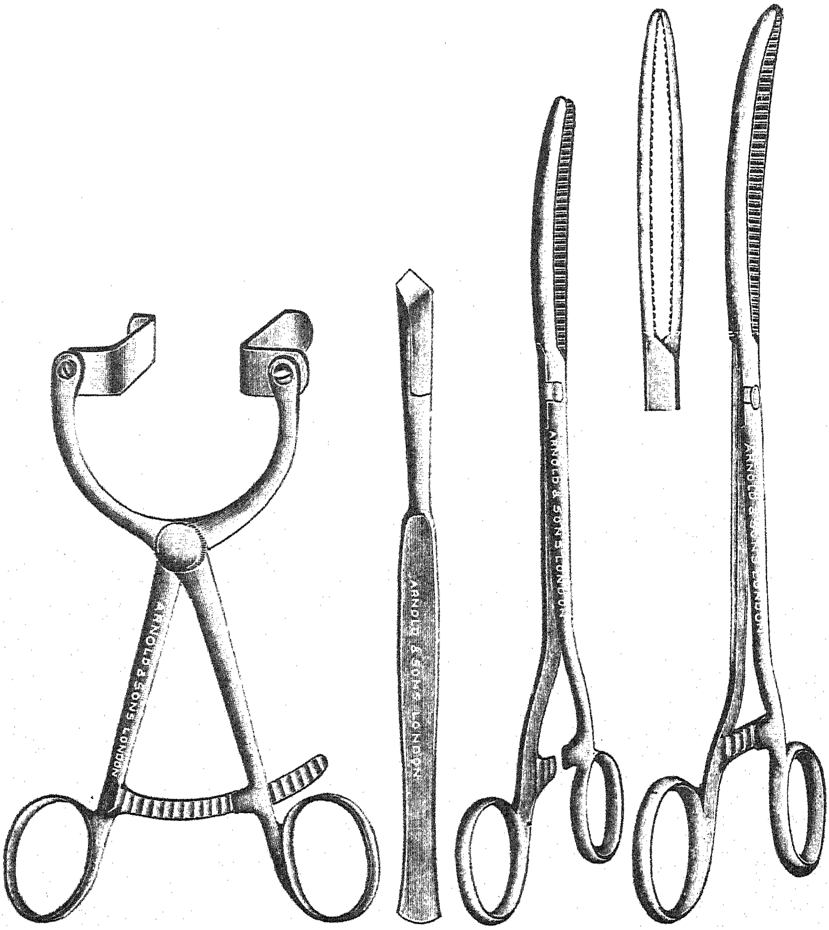
Certainly I have to some extent modified the technique of Dr. Williams's method of operating as described in the January VETERINARY JOURNAL of last year, in that I now strip *both* ventricles and at the same time do the whole operation *through the crico-thyroid ligament only*, without using a saw to cut the thyroid cartilage, nor yet the scalpel to cut the cricoid or tracheal rings, and for these two points I claim originality and consider that they are likely to increase very materially the proportion of successes, although a large number of the cases here reported have only had one vocal cord operated upon.

The special instruments necessary are modified from the original ones shown to me by Dr. Williams, but in principle are much the same, and I have to thank Messrs. Arnold and Sons for their courtesy and skill in making numerous patterns of retractors, forceps and stripping knives for my trial. The ones figured here are the ones I have thought the most convenient. They, and the swabbing forceps, with an ordinary scalpel and a couple of pairs of artery forceps, are all which are required, and the operation is practically a bloodless one.

Williams, in a paper read before the American Veterinary Medical Association at New Haven, Connecticut, in 1906, fully acknowledged to Günther of Hanover the hints he had obtained from the work this surgeon did in 1834, although he states that "the exact technique of these operations we have been unable to determine, but the results were quite unsatisfactory, and they apparently abandoned the effort."

That the Günthers essayed removal of one and both vocal cords respectively, and also resected the arytenoid cartilage, is certain, and

perhaps the mucosa of the ventricle; but, if so, why their efforts were unsatisfactory in the face of the results of the undermentioned cases I cannot imagine. It seems impossible that it can have been the same operation.



Retractor. Special knife. Operating forceps. Swabbing forceps.

The special instruments required.

I can only think that either they did not go far enough or else did too much; there may be a good deal in this last statement, for I am convinced that it is easy to make either fault. It is one of the most delicate of all the operations which the veterinary specialist is called upon to perform, and one in which the operator must do *just*

enough—to remove too little or to remove too much will be likely to lead to failure—as the object of complete closure of the ventricle and the subsequent adhesion of the offending vocal cord to the wall of the larynx, well out of the lumen of the larynx, will not be attained.

Naturally, as with every surgical procedure (in this as with all other operations), a veterinary adviser should have sufficient discretion never to promise a cure in *every* case, but I can now justifiably assert that this operation has given to the profession a method by which, at the very least, an amelioration can be promised in a very high percentage of cases, and that there is a prospect of a cure even sufficient to enable the animal to pass any ordinary veterinary test for soundness of wind. *The "useless" beast can, in a reasonable proportion of cases, be made "useful,"* and even if the noisy respiration does not entirely disappear, provided the horse can work without distress, an owner is grateful. No owner or groom likes a tube to be inserted if it can be avoided; it is too much trouble to keep clean, and too much of a nuisance for many other reasons, and even supposing the relief given is the same as when a tube is inserted, and a certain amount of noise remains, an owner is grateful if his horse can be enabled to work without distress.

The following are cases in which sufficient benefit has followed the operation to make it termed a satisfactory result. Some have been operated upon on the left side only, some on both, and I propose, at a later date, to compare the respective percentage of successes attained by each, and also to note whether it is advisable to try the effect of one side first, and then the second side at a later date if necessary, or to make a universal practice of doing both sides at one and the same time.

CASE 1.—Bay hunter gelding, aged 10, a big upstanding horse. This horse was a bad whistler, and got very distressed when ridden uphill, or for any distance at a gallop. He was sent to have a tracheotomy tube inserted. The ventricle stripping operation, on the left side only, was performed on September 10, 1909, and on October 2, my partner, Mr. Sutton, F.R.C.V.S., lunged the animal in a field and reported to me that he could hear no abnormal sound at all. On the 9th the horse was ridden twice round a large field at a gallop and the sound emitted was only slightly abnormal. It was then sent home, and was gradually exercised until in hunting condition. On December 16 I received a letter from a friend of the owner stating: "I saw Mr. —— in the hunting field on the horse to-day, the first time out. He has not heard the horse make any sound so far. He seemed very delighted about it, and said that he looked upon it as a miracle." At the end of the season I got a very nice letter from

Number of case	Date of operation	Class of horse	Age	Sex	Description before operation	Condition of vocal cords.	Result on first trial	Present report
	1909							
1	Sept. 10	Hunter	10	Gelding	Bad whistler	Left paralyzed	Excellent	Excellent.
2	,,	,,	9 or 10	,,	,,	,,	,,	,,
	1910							
5	Jan. 25	,,	7	,,	Bad roarer	,,	Much improved	Can gallop freely without distress.
8	Feb. 3	,,	10	,,	,,	,,	,,	Can gallop without distress, although makes noise. Second operation, Aug. 30.
10	Feb. 15	,,	6	,,	Bad roarer	Both moved freely	,,	Excellent.
11	,,	,,	8	,,	Bad whistler	Left paralyzed	Excellent	Practically cured, perhaps a little thick in wind.
18	April 1	,,	7	,,	Roarer	,,	Not very satisfactory	Satisfactory.
20	April 6	,,	...	,,	,,	,,	Good	Satisfactory.
22	,,	,,	...	,,	,,	,,	Excellent	Excellent.
25	April 10	,,	6	,,	Bad roarer	,,	,,	,,
29	,,	,,	8	,,	Roarer	,,	Not good	Second operation, Sept. 29. Now satisfactory.
31	April 15	Racer	3	,,	Bad roarer	,,	Slight whistler, but no distress	Slight whistler, but no distress.
33	April 16	Hunter	11	Mare	,,	,,	Satisfactory	Satisfactory.
35	,,	,,	7	Gelding	,,	,,	,,	,,
36	,,	,,	11	,,	,,	,,	Still very noisy	Second operation, Aug. 26, 1910. Much improved, and no distress.
38	,,	,,	9	,,	Whistler	,,	Improved	Improved.
40	,,	,,	5	,,	Bad whistler	Left moved slightly	Excellent	Excellent.
41	April 19	,,	8	,,	Confirmed roarer	Both moved freely	,,	,,

43	April 23	,, ...	7	,,	Bad whistler ...	Left moved slightly	,, ...	,,
44	,,	,, ...	9	,,	Bad roarer ...	Left paralyzed ...	,, ...	,,
45	April 24	,, ...	5	Mare	Bad whistler ...	Left moved slightly	,, ...	,,
50	,,	,, ...	12	Gelding	Bad roarer ...	Left paralyzed ...	,, ...	,,
51	,,	,, ...	7	,,	,, ...	,, ...	,, ...	,,
53	April 27	,, ...	7	,,	,, ...	Left moved slightly	,, ...	,,
55	,,	,, ...	9	,,	Bad roarer ...	Left paralyzed ...	Satisfactory	Satisfactory.
56	,,	,, ...	10	,,	,, ...	Both paralyzed ...	,, ...	,,
57	,,	,, ...	7	,,	Bad whistler ...	Left paralyzed ...	Excellent	Excellent.
58	April 30	,, ...	7	,,	Bad roarer ...	,, ...	Improved	Satisfactory.
64	May 4	,, ...	...	Mare	Moderate whistler	,, ...	Excellent	Excellent.
65	,,	,, ...	14	Gelding	Whistler	Left moved freely	Satisfactory	
67	,,	,, ...	...	Mare	Bad whistler ...	Left paralyzed ...	,, ...	Satisfactory improvement.
68	May 7	Van gelding ...	7	...	Bad roarer ...	Left moved slightly	,, ...	Satisfactory.
71	May 8	Hunter... ...	6	Gelding	,, ...	Left paralyzed ...	Temporarily better...	Second operation, Sept. 9. Excellent.
72	May 9	,, ...	8	,,	Roarer	,, ...	Not satisfactory ...	Excellent.
73	May 10	,, ...	16	,,	Bad roarer ...	,, ...	Excellent	,,
79	May 22	,, ...	12	,,	,, ...	,, ...	Not very satisfactory	Still some noise, but hunting without distress.
81	May 23	,, ...	...	...	,, ...	,, ...	Excellent	Excellent.
82	,,	Carriage ...	...	Gelding	,, ...	,, ...	Satisfactory	Satisfactory.
85	May 28	Harness horse...	9	...	,, ...	,, ...	Improved	Second operation, Aug. 3; now excellent.
87	May 30	Hunter... ...	6	Gelding	,, ...	,, ...	Excellent	Excellent.
89	June 1	,, ...	9	Mare	Roarer	,, ...	,, ...	,,
92	June 5	,, ...	9 or 10	Gelding	Bad whistler ...	,, ...	Not very satisfactory	Now satisfactory.
93	,,	,, ...	7	,,	Roarer	,, ...	Satisfactory	Satisfactory.
96	June 9	,, ...	15	,,	Bad roarer ...	,, ...	,, ...	,,
97	June 10	,, ...	9	,,	,, ...	Both paralyzed ...	Not satisfactory ...	Excellent.
98	June 11	,, ...	8	,,	,, ...	Left paralyzed ...	Satisfactory	Satisfactory.
100	June 12	Russian Orloff trotter	4	Mare	,, ...	,, ...	Excellent	Excellent.
101	,,	Russian trotter	4	Stallion	,, ...	,, ...	,, ...	,,

Number of case	Date of operation	Class of horse	Age	Sex	Description before operation	Condition of vocal cords	Result on first trial	Present report
	1910							
102	June 12	Racehorse ...	6	Gelding	Very bad roarer, been tubed	Both sides paralyzed	Satisfactory	Satisfactory.
106	June 15	Hunter	12	,,	Bad roarer ...	Left	Improved, but still makes noise	Second operation, Sept. 10. Now satisfactory.
107	June 16	Hunter	7	,,	Bad roarer ...	Left	Satisfactory	Satisfactory.
108	,,	,, ...	7	,,	Roarer	Left paralyzed ...	Exellent	Excellent.
109	June 17	,, ...	6	,,	,, ...	Left	Much improved ...	Satisfactory.
110	,,	Harness ...	6	,,	Bad roarer ...	,, ...	Satisfactory	,,
111	June 18	Hunter	10	,,	,, ...	Left paralyzed ...	Not good (2nd operation Oct. 20)	Now satisfactory.
115	June 26	,, ...	6	,,	Roarer	Left	Much improved	
116	June 27	,, ...	8	,,	Whistler	Left partly paralyzed.	Excellent	Excellent.
117	,,	,, ...	...	,,	Roarer	Left	Satisfactory	Satisfactory.
118	,,	,, ...	...	,,	Bad roarer ...	Both	,, ...	,,
119	June 29	,, ...	12	,,	Roarer	Left	Excellent	Excellent.
120	,,	,, ...	8	,,	Bad roarer ...	,, ...	,, ...	,,
124	July 2	,, ...	8	,,	,, ...	,, ...	Improved	Satisfactory.
126	July 5	,, ...	8	,,	,, ...	,, ...	Satisfactory	,,
127	,,	,, ...	9	,,	,, ...	,, ...	,, ...	,,
130	July 8	,, ...	3	,,	Roarer	,, ...	,, ...	,,
131	,,	,, ...	6	,,	Bad whistler ...	,,	,, ...	,,
134	July 11	Carriage ...	7	,,	Bad roarer ...	Both	,, ...	,,
136	July 14	Hunter	6	,,	Very bad roarer ...	Left	,, ...	,,
137	July 15	,, ...	8	,,	Bad whistler ...	,, ...	Excellent	Excellent.
138	,,	,, ...	7	,,	Bad roarer ...	,, ...	,, ...	,,
140	July 21	,, ...	6	,,	Roarer	,, ...	,, ...	,,
141	July 24	Hackney ...	5	,,	Bad roarer ...	,, ...	,, ...	,,
145	July 28	Hunter	4	,,	Bad whistler ...	,, ...	,, ...	,,
146	July 30	,, ...	7	,,	Roarer	Left paralyzed ...	Satisfactory	Satisfactory.
148	,,	,, ...	6	,,	Very bad roarer ...	Left	,, ...	,,
149	,,	Racer	5	Stallion	Bad roarer ...	,, ...	Excellent	Excellent.
151	Aug. 2	Hunter	8	Gelding	Bad whistler ...	Left partly paralysed	,, ...	,,

152	,,	,,	9	,,	Bad roarer	Left.	,,	,,
153	Aug. 3	,,	10	,,	,,	,,	,,	,,
160	Aug. 5	,,	6	,,	Slight whistler	Left partly	,,	,,
162	Aug. 6	,,	7	,,	Bad roarer	Left paralyzed	Satisfactory	Satisfactory.
163	,,	,,	6	,,	,,	Left	Excellent	Excellent.
167	Aug. 9	Carriage	9	,,	,,	,,	,,	,,
170	Aug. 12	Hunter	5	,,	,,	,,	,,	,,
171	,,	,,	5	,,	Bad whistler	,,	,,	,,
172	,,	,,	5	,,	,,	,,	,,	,,
173	Aug. 12	Hunter	5	Gelding	Bad whistler	Left paralyzed	Excellent	Excellent.
176	Aug. 20	,,	6	,,	Roarer	,,	,,	,,
178	,,	,,	Aged	,,	Whistler	,,	Satisfactory	Satisfactory.
181	Aug. 21	,,	5	Mare	Roarer	,,	Excellent	Excellent.
182	Aug. 22	,,	6	Gelding	,,	,,	,,	,,
183	,,	Shire	3	Stallion	Bad roarer	,,	,,	,,
185	Aug. 26	Hunter	9	Gelding	,,	,,	Satisfactory	Satisfactory.
186	,,	,,	4	,,	,,	,,	,,	,,
190	Sept. 8	,,	4½	Mare	Whistler	,,	,,	Excellent.
191	Sept. 13	,,	5	Gelding	Bad roarer	,,	,,	Satisfactory.
192	Sept. 14	Trooper	11	,,	,,	,,	,,	,,
193	,,	,,	7	,,	,,	,,	,,	,,
194	,,	,,	6	,,	,,	,,	Excellent	Excellent.
195	Sept. 17	Carriage	5	,,	,,	,,	,,	,,
196	,,	Hunter	12	,,	Roarer	,,	Satisfactory	Satisfactory.
197	,,	,,	8	,,	,,	,,	,,	,,
198	Sept. 18	,,	5	,,	Bad roarer	,,	,,	,,
199	Sept. 20	,,	12	,,	,,	,,	,,	,,
203	Oct. 1	,,	8	,,	,,	Left	Bad	Excellent.
204	Oct. 4	,,	9	,,	Roarer	,,	Satisfactory	Satisfactory.
205	Oct. 4	Pony	Aged	Gelding	Bad roarer	Left paralyzed.	Excellent	Excellent.
206	Oct. 7	Hunter	7	,,	Bad whistler	Left.	,,	,,
207	,,	,,	5	,,	Bad roarer	,,	,,	,,
208	,,	,,	5	,,	Whistler	Left partly paralyzed	,,	,,
214	Oct. 13	,,	7	,,	Bad roarer	Left.	,,	,,
216	,,	Harness	8	Mare	,,	,,	,,	,,

the owner, and only a few days ago (November, 1910) I received a further letter to say that he was riding his hunter again this season and that he was perfectly satisfied. His words were: "I was able to give the hunter a good gallop last Saturday, and I am glad to say that he still remains all right in the wind."

CASE 2.—A bay thoroughbred hunter gelding 9 or 10 years old, operated upon on September 10, 1909. This animal whistled badly and got very distressed, even when walking fast or trotting slowly uphill. On October 2, he was lunged severely by Mr. Sutton, who reported that he could hear no abnormal sound. On the 9th he was ridden twice round a field without distress, and on the 10th he was sent home into Somersetshire. On the 11th, the owner, in acknowledging his return, said: "He makes no noise at all as he used to when coming up Porlock Hill from the station," and Porlock Hill is, I understand, one of the steepest in England. On the 23rd, I got a note to say, "He can now trot uphill, which he could not do before his operation, without making a sound. We all think him cured." During the summer he was used as a hack and he has carried his owner this season through the Devon and Somerset country stag-hunting, and, more recently, foxhunting.

On October 4, 1910, I received a note to say: "I had the horse out with the foxhounds and he went awfully well. He makes no noise." I have received another letter this month (December) to say that the horse has been ridden "up some hills so steep that it is quite a scramble to get up, and he does not make the very smallest sound."

CASE 5.—February 29.—Galloped in riding school. Still makes a noise, but gallops freely without distress. Owner and groom very pleased.

April 8.—Owner expressed great pleasure at result.

August 10.—Tested horse again myself. He now makes a peculiar blowing sound, but gallops freely without any distress, and the noise ceases at once when pulled up.

CASE 8.—From a letter received this month (December) I quote the following: "I am very pleased to be able to tell you that my bay horse is going hunting regularly in his turn. He still, of course, makes a noise, but *much* less than formerly; and I ride him with discretion in hilly parts of the country, but on the flat he gallops and jumps in his old form."

Before operation the description given by the owner was that the horse had been first noticed to be a "whistler" at 4 years old. In 1909 he was such a bad roarer that he could not be hunted, as it was impossible to gallop far. He would usually fall down owing to dyspnœa at about the third fence.

CASE 10.—May 29, 1910.—Galloped hard and tested all ways by a well-known hunting veterinary surgeon in the presence of three other veterinary surgeons. Grunted sometimes (not always) when "taking off" at jumps, but otherwise galloped well, and was not at all distressed. No sound was heard by any of us when the horse galloped past, but the veterinary surgeon on the animal's back said he could occasionally hear a "slight wheeze" when the head was turned sharply to the left in the "figure of eight" test. The scar was imperceptible unless closely looked for.

CASE 18.—In December I received a letter from the owner, from which I quote the following: "The horse still makes a slight noise but nothing in comparison to last year before you operated. It stops him *slightly*, especially in the present heavy going, but you may judge of the difference by the following: Last year I rode him once with the staghounds; he was very much distressed and I could not keep him to the front at all. This year I have ridden him three or four times with the staghounds, good runs, longer and as fast as the one of last year, and he has gone well, keeping well up to the front and 'coming home on his toes.' He is quite a different horse in himself, he has filled out and keeps his condition, feeling well after hunting. He is also a different horse to ride and seems to move more strongly and is keener with hounds, although the going is, as you know, very deep at present."

CASE 22.—In December I received a note from a friend of the owner, who had seen the horse in the hunting field several times, to say that the horse had made a noise when it was first taken up, "but it has steadily improved, and continues to do so. Instead of being poor in condition, slack, and lifeless, as before the operation, it is now fat, and quite brisk and lively, and in regular work."

CASE 25.—On August 26, the owner wrote: "I am very pleased to tell you that I am delighted with the result of the operation. I have had the horse galloped this afternoon and am surprised at how slight a noise he now makes. If you were not looking out for it I do not think you would hear anything abnormal." In December of this year this horse was submitted to a test for wind by one of the best known hunting veterinary surgeons in the three kingdoms, and the following certificate was given:—

"*December* 8, 1910.

"This is to certify that I have this day examined a bay gelding, six years old, in height about 16 hands, and that the said gelding is in my opinion sound.

"———, M.R.C.V.S."

CASE 29.—This horse had been tubed for five months and had a lot of granulation tissue in the trachea. The owner expresses himself at the present time as well satisfied with the result.

CASE 31.—This colt was a bad roarer before the operation, and on November 18, 1910, I received a letter from which I quote the following:—

"I am sorry I have not written you before. H——'s colt is still a distinct whistler, but is much improved; no one would pass his wind as sound, yet it does not interfere with him now, whereas before he could not gallop round the paddock.

"———, M.R.C.V.S."

CASES 33 and 35.—In December I received the following communication: "My mare still makes a noise, more than before operation, but is unquestionably relieved and much less distressed than before it. Whereas she was of so little use last year as to be not worth keeping, she can now be easily nursed through an ordinary hunt."

Captain T—— tells me the same of his horse—that the noise is increased, but the distress lessened.

CASE 36.—The owner writes: "The noise is a different sound and much less. He is twice the horse he was before operation."

I operated a second time on August 26, and from a letter received in December I quote the following: "I have only hunted the horse you operated on for me twice. I have not had him properly fit, but certainly the noise was very greatly lessened. He used to be very audible when trotting: now you can hear him cantering, but not very much. I think it improved his staying powers considerably, but owing to his legs having gone wrong, I am unable to speak as definitely as I should like. That the noise is *greatly ameliorated* I do know, and the second operation much reduced the noise after you heard him. I should put it that the first operation lessened the noise by two-thirds, and the second by two-thirds to one-half of that, so that the final result is that he makes about one-sixth of the noise he originally did. I should certainly repeat the experiment if any horse I liked became a bad enough roarer to make him apt to get unduly distressed."

CASE 38.—From a letter received in December I quote as follows: "The 'Nigger' does not make nearly so much noise. Previous to his operation he never seemed to be stopped by his wind, and it does not stop him now. On the whole he has been improved by the operation."

CASE 41.—A quotation from a letter received on December 5 states: "Mr. S——'s horse, on which you operated in April last, is, by his owner, considered sound.

"———, M.R.C.V.S."

CASE 44.—I quote from a letter dated December 2, 1910: "You will remember that Mr. G——'s horse made a lot of noise and had done so several seasons. Mr. G—— tells me that he considers him to be sound in his wind, and he is a very good judge.

"———, M.R.C.V.S."

CASE 45.—In November the owner wrote: "The horse is hunting regularly. I would not like to guarantee the animal as actually 'sound,' but he is 'sound enough' and satisfactory. I am delighted."

CASE 53.—An extract from the owner's letter, dated November 22, says: "I thought you might be interested to hear that the bay gelding you operated upon for wind for me has turned out a complete success. Our veterinary officer cannot find that he makes any noise, nor can I. I rode him in the heavy weight point-to-point here, 3½ miles over big fences, and he ran a dead heat for first place in fair company. He is pretty fit—in fact, quite as fit as you can expect, considering that he was not especially prepared in any way for the race, and all he does is to exercise and hunt once a week. I left him in a big box all the summer, and took him up on August 14, and he is now very well and fit."

The veterinary officer, who examined the horse, also wrote me as follows: "I am glad to say that I consider the operation on B——'s horse to be an absolute success. I have ridden him myself and tried him in every way (long gallops, short gallops, up hill, and cantering), and he makes no noise at all. I saw him win the point-to-point, 3½ miles." He enclosed the following certificate:

"I hereby certify that the bay hunter gelding, the property of B——, Esq., which was operated upon in March, 1910, for whistling, now makes no noise in his work.

"———, M.R.C.V.S."

Case 55.—This horse had been "tubed" for five months. In November the owner stated:—

"I am very pleased with the result, and should certainly have another roarer operated upon if I had one. The horse still makes a little noise, but nothing like he did before with the tube, and he does his work satisfactorily."

Case 57.—On September 19 the owner wrote: "I am writing to tell you that I think the brown horse is cured."

Case 58.—From a letter received from the owner in December, I quote as follows: "'Major Mick,' the horse first operated on, is not a 'cure,' but is very much improved. I have been laid up, but the other day I had an hour and a quarter on him; his wind did not affect him, and I should say that the operation was worth the money to a horse of his type."

Case 64.—This horse was purchased as a whistler for £20, and was subsequently sold for £200 a few months after the operation, being passed by a veterinary surgeon.

Case 68.—A letter dated October 10 stated that the horse had been sold and was working all right, and that the man who drove the horse (a very knowing fellow!) said that he had never noticed the slightest defect in wind.

Case 72.—On November 19, 1910, I received the following letter: "You asked me to let you know how the horse you operated on for his wind in the summer went on when hunted, and I am glad to be able to tell you that he has improved wonderfully. You cannot hear him at all trotting now, and although when galloping he still makes a noise, it is nothing compared to what it used to be, so that I am very glad I had it done."

Case 73.—On October 17 I received the following letter: "The result of the operation is a perfect cure. The owner is delighted at the splendid recovery the horse has made. He makes no noise in his gallops, and I think you may consider it an absolute success.

"———, M.R.C.V.S."

Case 79.—In December I received a letter from which I extract the following: "The horse you operated on is hunting regularly. He makes a noise when pulling, which he seems to do more than he previously did, also in deep land. At one time I thought he made very little noise at all. There is no doubt that he much improved on the year before."

Case 81.—On November 28 I received the following letter: "I am sorry I have not written to you before with reference to the horse you operated upon for me, but I thought I should like to be quite certain before I gave you my opinion. I am now practically sure that the horse is cured; so far as I believe I could sell him as sound, though I have not, up to the present, submitted him to a veterinary examination. I hope you have had equal success with others."

Case 85.—On September 13 I received a letter: "The bay horse is greatly improved. I cannot hear him whistle at all in harness, even when driven sharply up hill. Before his first operation he roared very loudly, and before the second he made a good deal of noise in doing exactly the same hill at the same pace he does now without making any noise. I drive with rubber tyres, and should hear the noise if he made any.

"———, M.R.C.V.S."

Case 87.—On November 27 the owner wrote: "You will be glad to hear that the horse is now perfectly sound in his wind, and I have been hunting him regularly. Of course he still grunts, unfortunately, but nothing could alter that. It also requires a strong imagination to find the mark of the scar, even knowing where it is.

He also enclosed the following veterinary certificate, dated December 6: "I am glad to write that I do not detect any unsound noise in your horse's inspiration, either in slow or fast paces.

"———, M.R.C.V.S."

Before operation the horse could not gallop three times round a well-known London riding school without great distress.

Case 92.—A letter in December said: "The horse has improved a good deal since I wrote you in September. Although he still makes a good deal of noise it does not seem to stop him as it used to. I may perhaps consider the question of the second operation at the end of the season."

Case 98.—"'Goliath,' the 17.3 bay, I have not galloped out myself, but my nephew and groom have both ridden him and they say they can hear nothing; presently I will have him tried and send you vet.'s report."

Cases 137 and 138.—On December 26 I received the following report: "Both the cases are a success, if not complete are perfectly satisfactory, and in each case a previously useless hunter is restored to good working order.

"———, M.R.C.V.S."

Case 151.—On October 18 I received the following reports:—

The owner wrote as follows: "My horse, 'John Peel,' has been at walking exercise six weeks, and trotting exercise three weeks, and last Saturday I took him out cubhunting, and although he had never had a canter (beyond 100 yards), I got Mr. H—— to get on him and try him for his wind. He took him about two miles 'full bust,' and, I am delighted to say, he says he is 'sound in wind,' though he can still make him grunt, as he *always* did. What successes in other quarters?"

The veterinary surgeon whom I met in consultation over the operation wrote on October 16 as follows: "I galloped the bay hunter to-day belonging to Captain ——, operated on August 2, and gave him a good gallop of one mile and a half. I find this horse going sound, and, in my opinion, perfectly sound in his wind. This horse does not blow or make any noise, and I consider this a very satisfactory result. I rode the horse myself, and as I ride 15 st., I consider this quite test enough. He still grunts at the stick.

"———, M.R.C.V.S."

Case 152.—"December 28, 1910. I have not had the opportunity of galloping Captain W——'s horse, but I have seen Mr. E——, and he says that Captain W—— has given this horse a strong gallop of three miles, and he could not hear any noise.

"This horse was a pronounced roarer, and I should say that this case could be classified amongst your successful ones.

"———, M.R.C.V.S."

Case 153.—On November 4, 1910, I received the following report from the veterinary surgeon whom I met in consultation over the operation: "I have not had a chance to try him in a gallop till

Tuesday last. We were out hunting, and I galloped side by side with him for a considerable distance. I could hear very little, so slight that I think when he is fit it will be imperceptible; he grunts a little at the stick, but nothing like he did. There is no doubt it is a wonderful improvement in this case, as before you could hear him roaring a considerable distance away.

"———, M.R.C.V.S."

CASE 105.—From a letter dated December 27, 1910, I quote: "Mr. D——'s is certainly improved, and also since you last saw him; he is at regular work hunting, and as you know the ground has been very trying. He still makes a distinct noise and grunts, but can 'go on' with it.

"———, M.R.C.V.S."

CASE 106.—The following extract is taken from a letter written on December 27: "I gave this one a good 2½ miles gallop full speed last Thursday, and he did it alright. He still makes a distinct noise. At first, after the second operation, they were very disappointed, and he could not go any distance, but a *very great improvement* set in as the horse was conditioned. He was hopeless to 'class' last year, but he is a fine steeplechaser, and my opinion is that he will do his four-mile course (and I hope win) this season, so long as the ground is not too deep at the time. After his 2½ miles he was not at all distressed, and the noise ceased in just under thirty seconds (by the watch).

"———, M.R.C.V.S."

CASE 108.—A letter dated January 1, 1911, states: "I think your operation to my bay hunter is a complete success. I have only hunted him twice, but at the present moment I am very pleased with the result. He is practically noiseless in his trot and canter; in his gallop you can still hear a bit; he is, I consider, in better condition and freer in his work."

CASE 109.—From a letter dated December 27, 1910, written by the veterinary surgeon whose patient the horse originally was, I quote: "Mr. W——'s horse is much improved but I believe has been sold in consequence of W—— giving up hunting, so cannot trace him now.

"———, M.R.C.V.S."

CASE 111.—January 1, 1911: "The horse was not put with any work until Wednesday last, and I had a gallop on him this morning. There is a great improvement: He is now a useful horse and can keep going. I galloped him as hard as he could go for a good mile. After the first operation and with a similar gallop he had to stop, but to-day I had to pull him up, and he could have gone on quite comfortably. The noise is not nearly so pronounced and does not increase when the horse is pressed. I am hopeful that there will be still more improvement as the horse gets condition. However, B—— has now got a useful horse where before he had an animal that was only fit either to tube or shoot.

"———, M.R.C.V.S."

CASE 117.—From a letter dated December 27, 1910, I extract the following: "As to the success of the operation: After I had got him fit you could hear very little noise, in fact none, unless the going was heavy, on our ordinary days' hunting. It would distinctly be audible in a point to point and would stop him a bit. The improvement is

enormous on last year, when he was hardly fit to hunt. Last week I galloped into a bog and he nearly drowned, as his head got underneath him for quite a minute, and I was very much afraid that he might have torn away the adhesion in his struggles. However, I hunted him all day yesterday through two good runs; not very fast, but one was a six mile point to point in about forty-five minutes, and I did not hear him."

CASE 118.—December 28, 1910: "I have delayed writing to report upon the big horse, upon which you operated in the summer, until I had given him a good trial, and it was not until a very short time ago that I dropped into a gallop with him, which was good enough to try him. I was intending to let you know about him when the pressure of Xmas writing was over, and found your letter on my return home late this evening. The horse has very much improved since I spoke to you through the telephone; he makes much less noise than he did then; in fact, when not pressed on the flat and in good going he makes very little. In deep going, though, when pressed he still makes a certain amount of noise, and he does not manage a hill very well. However, the horse does not get distressed, is very keen, and I can see a hunt on him now. He is a very different horse to last season, when he could not go two fields in the deep ground. If the horse continues as at present to the end of the season I shall consider that it was quite worth while having the operation done. Lady V——, who is hunting from here, tells me that the result on her horse has been very much the same as on mine."

CASE 145.—"December 28, 1910. I myself rode Mr. L——'s 4-year-old about a fortnight ago, and with the exception of grunting at times he is otherwise alright, and no day or long gallop is too much for him. If I had been examining Mr. L——'s horse and had not known he had been operated upon, I certainly should have been suspicious about his wind, because when riding across ridge and furrow he grunted a bit, and also when turning or suddenly pulled up, but I could not detect any noise directly he was pulled up. I should certainly say that this case was a success.

"————, M.R.C.V.S."

CASE 146.—"December 29, 1910. The horse you operated upon is not cured, but undoubtedly better, and I have hunted him without hearing much noise or him getting distressed."

CASE 167.—This horse belonged to a well-known firm of jobmasters, and was returned to them as too noisy in his work and distressed when pressed.

In December a report received stated that the result was quite satisfactory, and that the horse had now gone away again on job without any complaint being received or defect in wind observable.

CASE 170.—The owner of this horse had refused £150 for the animal as a two-year-old, and £300 at 4 years. The beast became a bad roarer and was now valued at £20.

On October 28 I received a letter from which I extract the following: "You will be pleased to hear that Mr. R——'s horse is a great success. I examined him almost two weeks ago, and he is now practically a sound horse—a slight wheezing noise can be barely heard. You'll remember he was a roarer and a bad grunter. He doesn't grunt now. He used to grunt badly from a stick, or over his fences. I put

him over a number of fences and "not a murmur." He makes a slight sound from the stick.

"———, M.R.C.V.S."

On November 16 I received a further communication—"The operation has been a great success."

CASE 171.—On October 10 I received a note from the veterinary surgeon whom I met in consultation over the case to say that the animal had been galloped in the presence of the owner and himself, and that neither of them could detect any unsoundness in wind. The animal had run away on one occasion since the operation—a thing which was impossible for any distance before, as previously he would speedily have "choked down" for want of breath.

CASE 172.—The owner of this horse was so delighted at the result that he bought two more roarers on the first opportunity, and has since had them operated upon.

CASE 173.—On October 10 this horse was tested in every conceivable way in a large park in the presence of four veterinary surgeons—at a gallop on the straight, in a circle (each way), and figure of eight. The groom who rode the horse said that the animal could not possibly have done the tests prior to operation. There was no noise at all at the trot or canter, but after above five minutes' gallop we could hear a slight "blowing" sound, but the horse moved freely and without distress, and upon being pulled up settled down within two minutes. Since then, on November 14, I have received a note from one of the veterinary surgeons who was present at the test, to say that now the horse is in better condition this has greatly improved, and the owner is perfectly satisfied.

CASES 176 and 178.—This month (December) I have received the following report from the veterinary surgeon whose patients they were: "Major B——'s horse is decidedly better, and is hunting regularly. Major M—— reports that his horse is cured.

"———, M.R.C.V.S."

CASES 182 and 183.—From a letter received on December 12 I extract the following: "The bay hunter and the Lincolnshire cart horse have both been galloped and neither make any noise. I can detect a slight roughness in the respiration, but had it not been known that the horses had been operated upon no notice would have been taken.

"———, M.R.C.V.S."

CASE 190.—On November 10 the owner reported: "I have galloped the mare, and consider her perfectly sound in wind."

CASE 191.—This horse was a little suspicious in regard to his wind even as a foal, but after a severe attack of strangles at four years old became a bad whistler, and now was described as a rank roarer. On December 22 I received the following report: "The grey is in most beautiful condition, he gallops very strong and free, and can stay well, but he makes a blowing sound like wind coming through an inch pipe."

CASES 192, 193, and 194.—On December 27 I received the following letter from the veterinary officer in charge of the cases:—

"I galloped the three horses last week. The old horse (Case 192) is better, but still makes a certain amount of noise; the 7-year old (Case 193) is much better, but still there is no doubt about his wind; the 6-year old (Case 194) I could not get a sound from.

"To sum up, my opinion is this: all the horses are very much better, and are now quite able to do hard and fast work, which they were not able to do before the operation, and it seems to me that the younger you can get them the more chance of a complete cure."

CASES 196 and 197.—On November 28 I received the following report from the veterinary surgeon whose patients they were:—

"I saw Mr. C——, the owner of one of the horses to-day, and he said he hunted his horse last week, and in a very heavy going and a long gallop. He said the horse was 80 per cent. better, so that is satisfactory. I will see A——, the owner of the other horse (the bay) in a few days and let you know. He is very pleased.

"————, M.R.C.V.S."

In a further letter from the same veterinary surgeon, dated December 22, 1910, the following communication was made regarding the first horse mentioned above: "Mr. C—— continues to be more than pleased about his hunter."

CASE 198.—On October 18 I received the following letter:—

"I am writing to tell you that I sold my bay horse for £50 to Mr. L——, whom I am staying with here.

"I am looking out for the same type of horse again, and will bring him along to you if I find one." This horse was bought for £20 five weeks previously and was a bad roarer.

CASE 198.—Since then (December) I have received the following note from the present owner: "The horse is not absolutely silent, but he is so much improved that he can give me a good day's hunting without distress. I could not warrant him sound, as he grunts to a stick, but for all purposes, bar selling, I should call him sound enough. I have not got him as fit as I could wish, for the hunting has been so very heavy that I have had rather to nurse him, but if the country dries up a bit soon, I hope to have him fit for a point-to-point, unless I sell him before."

CASE 199.—"December 28, 1910. The black horse makes very little noise now, if any. He is improving in condition.

"————, M.R.C.V.S."

CASE 203.—On November 18 I had a letter to say that the horse made more noise than ever. I replied advising to give the animal several good gallops, and on December 4 I received the following satisfactory report:—

"You will be delighted to hear the bay gelding was in a run of 60 minutes on Monday and never made the slightest noise.

"————, M.R.C.V.S."

CASE 205.—This pony was such a bad roarer, and so much distressed in his work, that on two separate occasions the owner was stopped in the street by bystanders and requested to take it out of the shafts, and on a third occasion he was warned by an inspector of the Royal Society for the Prevention of Cruelty to Animals that he would be prosecuted if seen working it again. To trot or gallop was impossible. After the operation, on December 17, I received the following report: "The pony appears quite sound now. He has been at work for the last three weeks, and I gave him a gallop last Tuesday. He makes no noise.

"————, F.R.C.V.S."

CASE 216.—This mare had been "tubed" some two years before, and was a bad roarer, being very distressed if pressed in her work. On December 5 I received the following: "The roan mare that you operated upon some two months since for 'roaring' is now perfectly sound in wind; she takes her turn with the others, her condition is better now than it has been for two years past—in fact, it is a perfect success in every way. I drove her nine miles last Friday and did not spare her, either up or down hill, and I could not detect the slightest noise; previously you could hear her twenty yards away.

"————, M.R.C.V.S."

CONCLUDING REMARKS.

It is not my intention in this article to enter deeply into the hundred and one side issues which affect "roaring." The subject of the respective parts played by heredity, strangles, and other causes, the actual reason why "roaring" is produced, the reason why the left side should primarily be affected, and many other things, are each worthy of an article to themselves, respectively. Suffice it to be able to assert at the present time that we have now attained a position from which the positive assertion can be made that the distressing disease known as "roaring" can be ameliorated and in some instances completely cured. At any rate, a useless beast can be made useful, and this, not in isolated cases, but in a very high proportion of instances; this conclusion is one which can, beyond dispute, be drawn from a perusal of the above extracts, which are here published without elaboration, being the criticisms and opinions of the owners themselves.

In the above tables and details the first 216 consecutive cases are taken, carrying me down to October 16, 1910, a date as far as it is fair to go considering that the patient is given some two months' rest after the operation. 112 cases are reported upon and may fairly be said to be satisfactory, as in every instance the owner has been pleased, and this represents a little over 50 per cent., but this does not by any means represent the fair proportion of successes; it will really work out very much higher when the statistics are complete.

From a number of owners I have not yet had replies; as probably they are abroad and I ought to have given them longer notice, but many of them have sent horses of friends for operation since their own was done, and *in no single instance*, out of 248 cases operated upon to this date, has there been any unpleasant letter or remark from an owner on the result. The worst which can happen is that the horse must be "tubed," and that would already have had to be done, in the majority of instances, had not the operation given relief.

My own impression is, and I have some experience now to "back up" my opinion, that next hunting season will see these *ci-devant* roarers "pull out" better in wind than they are this year, and I am certainly of opinion now that the proper procedure for an owner to adopt is to have his horse operated upon at the end of the one hunting season and forget him until the beginning of the next.

Two clear months rest, although by no means essential, is the wiser method to ensure success and allow a firm adhesion of the paralysed vocal cord to the wall of the larynx, and also some absorption of the thickening necessarily produced.

Time alone will show whether these ideas are correct or not, and I shall certainly trace the above group of horses through the second and perhaps even through a third year. At the same time, as several owners have remarked, if by this operation we can only give an old favourite one more season without a tube, it is worth doing. That this can be done is an established fact and well past the experimental stage, and as several reports have said, it gives more than a "sporting" chance of converting a "useless" beast into a useful one.

THE SERUM TREATMENT OF PULMONARY AFFECTIONS IN THE HORSE.

By C. H. H. JOLLIFFE, F.R.C.V.S.
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HAVING recently had some limited experience of the serum treatment of this prevalent and frequently fatal class of disease in equines, and having been more than satisfied with its results, I venture to publish a few notes on the subject in conjunction with clinical reports of some of the cases so treated, bearing in mind due caution and reserve necessary where only small numbers apply.

The sera employed have been "influenza antitoxin," prepared by Messrs. Parke, Davis and Co., and an "antipneumonic serum" obtained from Holland. The former has been used in five cases, and the latter in seventeen. In none of these twenty-two cases has there been a fatal result. Some of the cases have been only slight ones, and would doubtless have recovered under no such treatment. Others, on the contrary, have been very serious cases (*e.g.*, Nos. 8 and 9), showing all signs of probably taking an unfavourable course: and on the whole, judging from my own limited experience up to date, there seems good reason to suppose that both these sera, if *given early* and persevered with, and associated with favourable hygienic conditions, possess a distinct influence in increasing the patient's resistance to the bacterial invasion of which he is the subject.

The sera have been employed in all classes of pyrexial illness of an influenza, strangles, and catarrhal fever type. In some the infection has subsided without further complications; in others pulmonary or pleural implication has subsequently supervened, whilst in others, again, there has been undoubted physical evidence of grave pulmonary lesions from the commencement of the treatment and every indication for a very guarded or even unfavourable prognosis. In all, as already stated, recovery has resulted. A few examples from each variety of case have been selected, and full clinical details of these,

together with charts of temperature, pulse, and respiration, are appended.

The "influenza antitoxin" is issued in 30-c.c. vials, and is intended for intravenous injection. Full instructions as to dosage and technique accompany each vial.

The "antipneumonic serum" is a Dutch product that has recently been on trial in the Army Veterinary Service. It consists of two sera, known respectively as "A" and "B." The two sera are directed to be subcutaneously injected in 10-c.c. doses on alternate days, commencing with the "A" serum and continuing the alternate administration daily, according to the requirements of the case. From information kindly furnished me by Major O. C. Newsom, A.V.C., I understand that these (Dutch) sera are obtained from the blood of horses hyperimmunized against bacteria said to be associated with equine pneumonia, an ovoid organism being used in the case of the "A" serum, and a bacillus in the case of the "B" serum.

Adopting all ordinary antiseptic precautions, I have never seen the slightest trace of ill-effect either from the subcutaneous or intrajugular injection of any of these sera. In the case of the latter injection it is more than advisable to shave the skin over the site of injection, and, either by the application of tinct. iodi. or other method, to render it as nearly aseptic as possible, whilst the syringe, needles, and any vessel into which the fluid may be transferred for the purpose of filling the syringe should be rigorously sterilized by boiling immediately before use, and every care taken to prevent their subsequent contamination.

In conclusion, it may be stated that the writer has entirely given up the forcible administration of the usual "fever drenches" (stimulants, diaphoretics, febrifuges, &c.) generally prescribed in cases of this nature, and, judging by results, he is becoming more convinced as time goes on that patients fare just as well, and probably a good deal better, without any such treatment.

In the first place, I am extremely sceptical as to whether drugs of this kind really possess any genuine therapeutic value at all.

In the second place, the fact of forcibly pouring a distasteful liquid down the unwilling throat of a resistant and struggling horse, already weak and ill, is bound to have an undesirable effect; to be, in fact, positively harmful, and should only be justifiable where the medicine administered is most urgently and *definitely* called for. We all know that every horse resents being "physicked"; the process probably

doubles his pulse and respiration every time, and must of necessity irritate, excite, and distress him—all obviously injurious factors—whilst if he is additionally the subject of pulmonary disease and dyspnœa, not only are these evils increased tenfold, but it is also more than likely that if the "drenching" is persisted with—no matter how carefully—some portion of the liquid will from time to time find its way into the respiratory passages and so add fuel to the fire which it is our aim to extinguish.

Thus, in the opinion of the writer, it is by no means difficult to aggravate a horse's illness and oppose his powers of resistance, or natural efforts at recovery, by "excess of treatment," and I consider that the practice of "drenching" horses affected with pulmonary and allied diseases is a thing to be most emphatically discouraged, and would suggest that we should do well in all cases of this description to confine our materia medica to the utmost limit to such agents as may be given in solution in the drinking water, smeared on the tongue as an electuary, or injected with a hypodermic syringe; an occasional "bolus" being also permissible if very definitely indicated. Above all, as need scarcely be added, should we urge the supreme necessity of perfect rest, roomy and hygienic surroundings, and abundance of fresh air, insisting at the same time on the vast superiority of a pure, though cool, atmosphere (even at the risk of that terrible and mysterious bogey, a draught!) over one that is warm but vitiated. The latter is at all times beloved of the average stableman, but never more so than when his horse is "sick."

It is the writer's practice to place all cases of existing or threatened pulmonary disease in the largest loose-box available, to leave all windows wide open day and night, and, with the exception of generally applying a counter-irritant to the chest, to *worry* the patient to the least possible degree.

Under such conditions I venture to believe that a considerably higher proportion of recoveries is obtained than occurs where the practitioner directs that the patient must at all costs be kept in a "thoroughly warm atmosphere" and have the "fever medicine" regularly and frequently administered.

As to isolation in this class of case, there can be no doubt that all modern veterinarians unanimously advocate this course.

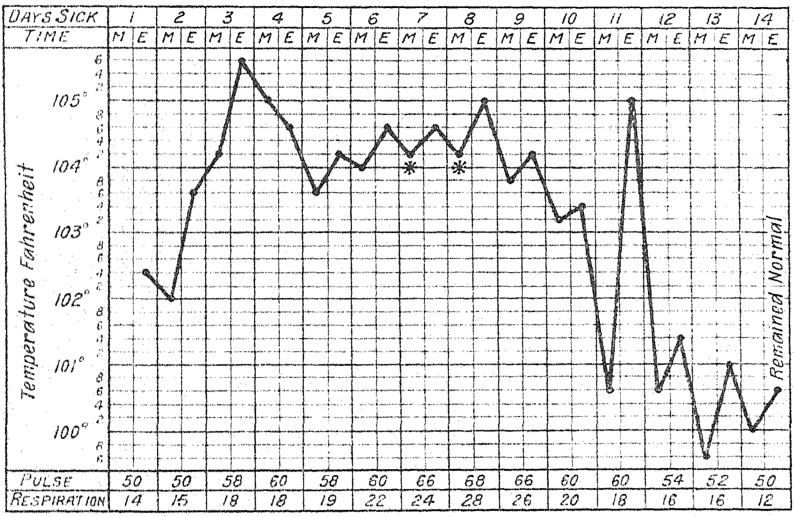
Case 1.—Troop-horse A 32; gelding, aged 3.
Disease.—Strangles (streptococcic catarrhal fever).
Treatment.—Parke Davis's influenza antitoxin by intravenous injection. *Admitted*, March 10, 1909; *discharged*, April 8, 1909. Cured.

Admitted evening of March 10, 1909; feeding badly, looking dull, and nasal discharges.

March 11.—Feeds moderately; slight submaxillary enlargement. Considerable bilateral nasal discharge. Physical examination of chest normal.

March 16.—Temperature remains high. Has been feeding badly. Spends much time lying down. Otherwise no further developments. Skin shaved and disinfected, and 30 c.c. influenza antitoxin aseptically injected into jugular vein with a sterilized syringe.

March 17.—Feeding better. Copious thick, white muco-purulent nasal discharge continues. Submaxillary enlargement shows slight increase; there is some tenderness and slight swelling over the laryn-



CASE 1.—Troop horse A 32, gelding, aged 3.

Treatment.—* 30 c.c. Parke, Davis & Co.'s influenza antitoxin by intrajugular injection.

geal region and upper end of trachea. A further 30 c.c. influenza antitoxin intravenously injected.

March 18.—Feeds well; otherwise no change. General appearance is bad, though physical signs are favourable.

March 20.—Progressing favourably. Physical examination of chest remains normal. Less nasal discharge.

March 21.—*Vide* chart. There is no change in general condition and nothing to account for last night's rise in temperature.

March 28.—Favourable and uneventful progress has been maintained. Submaxillary enlargement scarcely perceptible; swelling over laryngeal region has disappeared; nasal discharge has practically ceased, and horse's general condition is normal in every respect.

April 8.—Discharged cured, for very light duty, after an uninter-

rupted convalescence. Microscopic examination of nasal discharge showed quantities of cocci, both single and in chains.

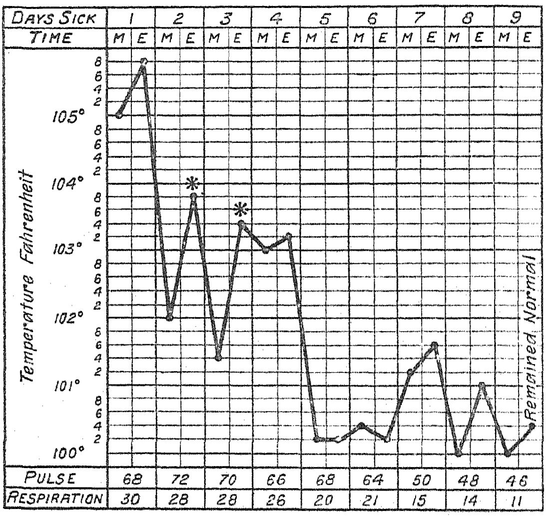
Case 2.—Troop-horse D 52; gelding, aged 5.

Disease.—Pleurisy with effusion, right side.

Treatment.—Parke Davis's influenza antitoxin by intrajugular injection. *Admitted*, March 23, 1909; *discharged*, April 19, 199. Cured.

March 23.—Reported to have left most of feed the previous night and to have eaten nothing this morning. Is "blowing," looks dull, and temperature found to be 105° F. Pulse frequent and weak. Conjunctivæ injected. Physical examination negative.

March 25.—No improvement. Feeds badly. Coughs occasionally. No nasal discharge or submaxillary enlargement. Physical examination shows indistinctness of vesicular murmur lower half of



Case 2.—Troop horse D. 52, gelding, aged 5.

Treatment.—* 30 c.c. Parke, Davis & Co.'s influenza antitoxin by intrajugular injection.

right side and some questionable dulness to percussion. Otherwise normal; 30 c.c. Parke Davis's influenza antitoxin injected into jugular vein.

March 26.—Physical examination shows loss of vesicular murmur lower half of right side, and well-marked dulness to percussion over lower third. Front and left side normal. Diagnosis: Pleurisy and hydrothorax right side. Respiration accelerated and pulse weak. Feeds very badly. Bowels constipated. Aloes ʒiv. administered; 30 c.c. influenza antitoxin injected as yesterday.

March 29.—Has been purging freely, and to-day shows slight abdominal pain, and general appearance not favourable, though physical signs indicate improvement. Dulness to percussion is less marked, respiration is better, pulse improved in tone and

reduced in frequency, and conjunctiva good. Feeding slightly better.

March 30.—Diarrhœa continues. Spends much time lying down. No evidence of abdominal pain since yesterday. On physical examination, vesicular murmur is distinctly audible over lower part of chest (right side), and dulness to percussion is scarcely apparent over this area. The rest of chest remains normal. Mixture containing creta. prep., p. catechu, sp. ammon. arom., and tr. opii administered as a drench in thin flour emulsion.

March 31.—Shows much improvement. Diarrhœa has ceased. Feeding well. Temperature, pulse, and respiration normal. Physical examination shows no abnormalities except some very slight and ill-defined dulness to percussion lower fourth of right side.

April 19.—Subsequent course entirely favourable. Discharged cured, to have nothing but lightest exercise for the next few weeks.

CASE 3.—Troop-horse D 28; mare, aged 5.

Disease.—Pulmonary congestion and broncho-pneumonia.

Treatment. — Parke Davis's influenza antitoxin by intravenous injection. *Admitted*, March 27, 1909; *discharged*, cured, May 23, 1909.

Admitted morning of March 27, with loss of appetite and high temperature. No diagnostic symptoms, and physical examination negative.

March 29.—Feeding very badly (eats only the smallest quantity of bran). Pulse weak. Conjunctivæ much injected. Urine and fæces normal. Physical examination of chest shows no definite change. Respiration accelerated and slightly laboured. Diagnosis, pulmonary congestion. 30 c.c. Parke Davis's influenza antitoxin aseptically injected into jugular vein.

March 30.—Slight improvement. Pulse better tone. Appetite somewhat improved, though refuses all hay. Conjunctivæ less congested. No enlargement of submaxillary glands or nasal discharge.

March 31.—General condition shows no change. Evidence of broncho-pneumonia left lung (crepitations and very slight dulness to percussion lower third left side). Occasional rales over base of trachea. Conjunctivæ hyperæmic. Coughs frequently.

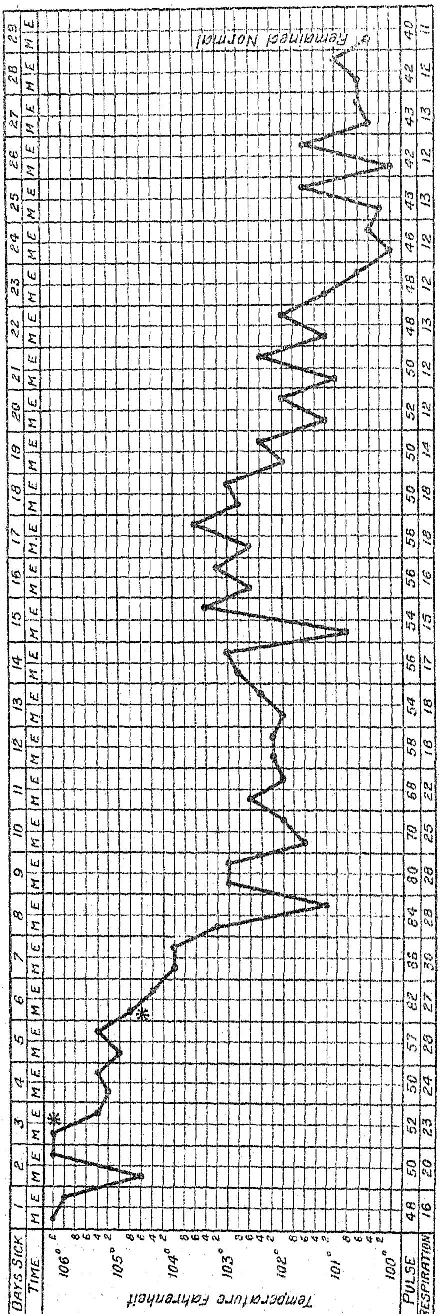
April 1.—Condition less favourable. Temperature keeps up, pulse frequency considerably increased, conjunctivæ more congested, and not feeding so well. Looks depressed, and cough continues. No alteration in physical signs except that tracheal rales were not heard. Mustard to sides, and 30 c.c. Parke Davis's influenza antitoxin intravenously injected.

April 2.—No improvement. Increased conjunctival injection. Appetite worse; pulse 86 and very weak; respiration rapid and dyspnœic. General appearance bad, yet there is no physical evidence of pulmonary implication of any extent.

April 4.—Slight improvement in character of respiration in conjunctivæ and in cardiac action. Pulse tension varies, an occasional systole occurs which is so weak as to produce no perceptible impulse. Appetite poor. Lies down a lot.

April 6.—Improvement maintained, though appetite continues bad.

April 8.—No material change. Conjunctivæ still much injected. No noteworthy abnormality on physical examination, though there are occasional loose rales over upper end of sternum, and some general indistinctness of vesicular murmur on left side.



CASE 3.—Troop horse D 28, mare, aged 5.

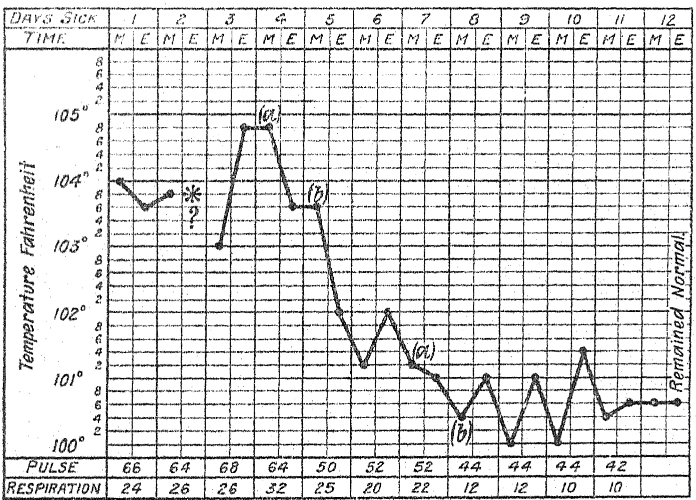
Treatment.—* 30 c.c. Parke, Davis & Co.'s influenza antitoxin by intrajugular injection.

April 9 to 12.—Progressing favourably. Feeding distinctly better. There has been no nasal discharge or submaxillary swelling.

April 14.—Favourable progress continued. Feeds slowly but finishes everything. Conjunctivæ normal, pulse practically normal, and respiration only very slightly accelerated, though temperature remains a trifle raised.

May 23.—Subsequent course favourable and uneventful. Discharged, cured, for light duty on this date.

Remarks.—Found to be a pronounced "roarer" shortly after return to duty. In this case there would appear to have been a "raging battle" for some days between the horse and his pneumonic invaders, and the question arises as to what extent the victory of the former over the latter may be accredited to the intervention of the antitoxin.



CASE 4.—Troop horse C 9, gelding, aged 7. *Anus dilated, temperature unregistrable.

Treatment.—(*a*) Antipneumonic serum *A* by subcutaneous injection.
(*b*) Antipneumonic serum *B* by subcutaneous injection.

CASE 4.—Troop-horse C 9; gelding, aged 7.

Disease.—Pleurisy with effusion.

Treatment.—Anti-pneumonic serum (*a*) and (*b*) by subcutaneous injection. *Admitted*, May 2, 1910; *discharged*, cured, June 6, 1901.

May 5.—Admitted morning of May 2, fever and anorexia. Since then the temperature has remained up and appetite has been bad, but hitherto there has been no signs other than those of simple fever. (No cough or nasal discharge.) To-day the horse looks fairly bright, but continues to feed badly, and respiration is markedly disturbed. There is a slight, thin, straw-coloured nasal discharge from both nostrils. *Physical examination:* Front and right side normal; left side, diminution of vesicular murmur upper half of chest; complete loss lower half,

and a large area of lower half is totally dull to percussion. Diagnosis, pleurisy and hydrothorax left pleural cavity. Is not coughing. Anti-pneumonic serum (*a*) subcutaneously injected.

(For subsequent anti-pneumonic injections see chart.)

May 6.—Feeds better. Pulse good tone. Conjunctivæ normal. Physical examination shows no change from yesterday, except that the area of total dulness is, if anything, a shade less, and the degree slightly less intense. General condition, slight improvement.

May 8.—Progressing favourably. Feeds well. Pulse good tone. Conjunctivæ normal. No nasal discharge. General appearance satisfactory, but is losing condition and appears weak. *Physical examination:* Front and right side continue normal. Left side, vesicular murmur remains inaudible. Dulness to percussion over lower half (becoming more marked inferiorly) is still present, but is less intense throughout and of smaller area than at last observation.

May 11.—Favourable progress maintained. *Physical examination* shows great improvement. Vesicular murmur is now clearly audible throughout on left side, and dulness to percussion on this side far less marked (only a small area of slight degree anteriorly lower fourth).

May 13.—Feeds well and progressing favourably in every respect. Is receiving Ol. lini. ℥ii. with liq. arsenicalis ʒvi. daily, with feed.

May 16.—Normal in every way. No abnormalities discoverable to physical examination. Heart beat is somewhat forcible and pulse strong.

June 6.—Subsequent course uneventful and satisfactory. Discharged for very light duty.

CASE 5.—Troop horse, C 56; gelding, aged 6.

Disease.—Pleuro-pneumonia and subsequent cardiac intermittence.

Treatment.—Antipneumonic serum (*a*) and (*b*). *Admitted*, May 12, 1910. *Discharged*, June 22, 1910. Cured.

May 12.—Was ridden in the school in the morning, and found to be going badly, and to have much bilateral nasal discharge (thin, straw-coloured), so was reported sick. Had not finished morning feed. Temperature 106·2° F.; pulse 84 and weak: respiration quiet. Physical examination of chest normal, except for slight "harshness" over trachea. Antipneumonic serum (*a*) injected as prophylactic. (For subsequent antipneumonic injection *vide* chart.)

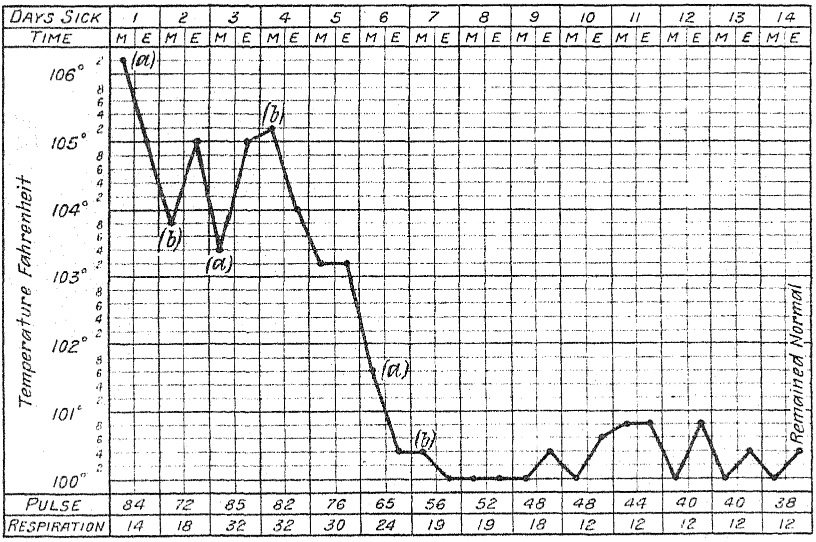
May 13.—Pulse very weak. Respiration accelerated, but not laboured. Feeds indifferently. Conjunctivæ practically normal. Is coughing. No submaxillary enlargement, and (to-day) no nasal discharge. *Physical examination:* Very slight "harshness" on auscultation over trachea. Right side, vesicular murmur loud, distinct and clear throughout. Resonant to percussion. Left side, vesicular murmur indistinct, and over lower fourth quite inaudible. Percussion shows an area of well-defined dulness commencing anteriorly about the eighth rib, and extending backwards. *Diagnosis.*—Pulmonary consolidation posterior part of left lung.

May 14.—Feeds badly; pulse rapid and weak. Conjunctivæ congested; not heard to cough. Respiration accelerated, but not laboured or associated with nostril dilatation. Looks dejected, and shows general appearance of serious illness.

May 16.—Finished feed last night, but has eaten practically nothing this morning. Looks dull, and pulse very poor tone. Not

heard to cough. Conjunctivæ less congested. Yesterday and to-day there has been a good deal of thin, serous, straw-coloured nasal discharge, but no submaxillary enlargement. Respiration quiet, but accelerated. *Physical examination:* Front and right side continue normal. Left side, vesicular murmur very indistinct upper third; quite inaudible lower two-thirds—this area being entirely devoid of sound. Lower half totally dull to percussion. *Diagnosis.*—Extensive pulmonary consolidation, accompanied with pleurisy and effusion left side. Weak blister to lower half of thorax on this side.

May 18.—Fed better yesterday, but not feeding so well to-day. Nasal discharge has diminished, and respiration less accelerated. Pulse reduced in frequency and improved in tone. General appearance is one of improvement.



CASE 5.—Troop horse D 56, gelding, aged 6.

Treatment.—(*a*) Antipneumonic serum *A* by subcutaneous injection.
(*b*) Antipneumonic serum *B* by subcutaneous injection.

May 19.—Feeding well. No cough, nasal discharge or submaxillary enlargement. *Physical examination*: Front and right sides normal. Left side, vesicular murmur remains inaudible over the greater part. Percussion note, however, shows great improvement since the 16th inst., the extensive dulness then observed having almost entirely cleared up.

May 21.—Feeds well. Pulse good tone, but is irregularly intermittent. Little or no nasal discharge. Physical examination of chest gives a practically normal result, except that respiratory murmur on left side is still to a great extent inaudible. There is some subcutaneous infiltration and swelling on this side, from the blister, which probably accounts for this. General condition satisfactory.

May 22.—Heart irregularly intermittent. Intermittence entirely erratic and arythmical, occurring at anything from fourth to sixtieth beat.

May 23.—Heart irregularly intermittent.

May 24.—Heart intermits constantly, generally after fourth and fifth beat alternately. Occasionally only a very brief pause between fourth and fifth or fifth and sixth, and then a marked intermission occurs after eighth.

May 25.—On first examination cardiac intermittence occurred regularly at every fifth beat, six times. Subsequently to this, three minutes' observation showed no intermittence whatever. General appearance satisfactory, and all other physical signs normal.

May 26.—No cardiac intermission during three minutes' observation (125 beats).

May 27.—No cardiac intermission during three minutes' observation (115 beats).

May 28.—One intermission observed in three minutes.

May 30.—No intermittence; cardiac action normal and perfectly regular. General progress satisfactory, and chest normal to physical examination.

May 31.—Cardiac action regular.

June 1.—One cardiac intermission during four minutes' observation.

June 2.—No cardiac intermission.

June 3.—One brief pause observed; cardiac action perfectly regular otherwise. To have half an hour's walking exercise night and morning (led).

June 22.—Horse appears strong and in good condition. Discharged for very light duty. No cardiac irregularity observed since last date.

Case 6.—Troop-horse D 33; gelding, aged 4.

Disease.—Strangles, with pulmonary implication.

Treatment.—One dose "strangline"; subsequently, antipneumonic serum (*a*) and (*b*). *Admitted*, May 25, 1910; *discharged*, July 14, 1910. Cured.

May 25.—Was seen last night to have a thickish, purulent nasal discharge (bilateral), and temperature 104° F. To-day there is no change. Respiration is accelerated, but feeds well. No submaxillary enlargement; 10 c.c. "strangline" (as prepared by Captain A. G. Todd, A.V.C., *vide* Veterinary Journal, August, 1910, p. 456) injected.

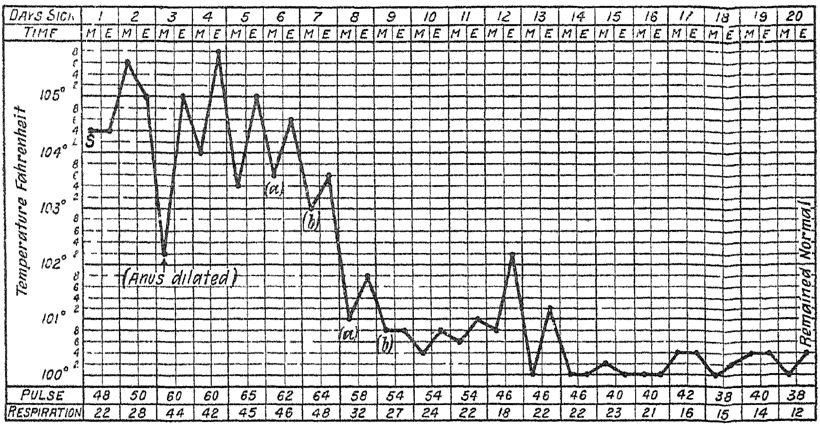
May 26.—Feeds well. Copious bilateral muco-purulent nasal discharge. Very slight submaxillary enlargement. Respiration accelerated, nostrils slightly dilated. Physical examination negative.

May 27.—Feeds well, but otherwise general appearance is bad. Temperature 102·2° F. only (but arms is slightly dilated). Respiration accelerated and dyspnœic. Conjunctivæ injected. Distinct submaxillary enlargement, particularly left side. *Physical examination:* Respiratory sound much accentuated over trachea. Vesicular murmur indistinct in comparison with the force of the respiration (equally so both sides). No abnormality to percussion. *Diagnosis* (present condition): Pulmonary congestion. Mustard to be applied to both sides of chest.

May 28.—Continues to feed well. Much nasal discharge continues Chest resonant to percussion, except for a suspicion of dulness lower fourth right side.

May 30.—No improvement. Very copious thick, purulent nasal discharge continues, but appetite is good, and horse looks fairly bright. Coughs a good deal, and respiration laboured and much accelerated. *Auscultation:* Pronounced loose rales over trachea. Vesicular murmur comparatively indistinct. *Percussion:* Slight dulness lower fourth, both sides; most marked right side. *Diagnosis:* Pulmonary congestion, with bronchitis and some questionable pleural effusion. Onset of pleuro-pneumonia appears highly probable. Very little reaction from mustard application on 27th, so ung. hydrarg. biniod. with cantharid. 1 : 30 applied to both sides, and anti-pneumonic serum injected.

May 31.—Much yellowish-white nasal discharge, and respiration



CASE 6.—Troop horse D 33, gelding, aged 4.

Treatment.—S. 10 c.c. "Strangline" injected (vide *Vet. Journ.*, August, 1910, page 456).
(*a*) Antipneumonic serum *A* 10 c.c. by subcutaneous injection.
(*b*) Antipneumonic serum *B* 10 c.c. by subcutaneous injection.

rapid and dyspnœic. Not feeding so well. Conjunctivæ congested. Pulse fairly good tone. *Auscultation:* Rales over trachea no longer perceptible. Vesicular murmur normal upper half, but quite inaudible lower half, both sides. *Percussion:* Gives well-defined and total dulness whole of lower half left side; doubtful dulness lower fifth, right side. (There is thus no longer any question as to pleural effusion on the left side.)

June 1.—Feeds better. Pulse tone good. Nasal discharge about the same. Conjunctivæ less congested. General inference, improvement (*see* also chart).

June 3.—Feeding well, and nasal discharge has decreased. Physical examination shows great improvement. Total dulness on lower half of left side, observed on 31st inst., having almost disappeared.

June 7.—Favourable progress maintained. Nasal discharge diminishing. Very slight submaxillary enlargement still present, and respiration remains accelerated, but there is nothing on physical examination to account for this, physical signs being apparently normal.

June 12.—Feeds well. Very slight nasal discharge. Conjunctivæ normal. Submaxillary enlargement scarcely perceptible.

June 15.—Slight nasal discharge continues, and horse appears weak, but is normal in all other respects.

June 20.—No nasal discharge and normal in every way, except for very slight submaxillary enlargement.

June 22.—There is a small amount of thin mucoid nasal discharge, mostly from right nostril. No cough.

June 23.—Nasal discharge continues. No cough.

June 30.—No nasal discharge the last few days. A trace of submaxillary enlargement is still present (this is being painted with tr. iodi.). Otherwise normal in every way.

July 7.—No nasal discharge, and submaxillary enlargement has disappeared. Is normal in every respect.

July 14.—Discharged cured, for light duty.

Case 7.—Officer's charger (Captain S. J. C.); mare, aged 4.

Disease.—Pneumonia, with pleurisy and hydrothorax.

Treatment.—Antipneumonic serum (*a*) and (*b*). *Admitted*, July 25, 1910, *discharged*, September 7, 1910. Cured.

July 25.—Admitted with history of being off feed, having nasal discharge and slight cough. Pulse good; respiration accelerated; conjunctivæ injected. *Physical examination:* Faint rales over base of trachea. Left side, vesicular murmur loud and distinct; resonant to percussion. Right side, vesicular murmur indistinct over upper half, almost inaudible (with very faint crepitations) over lower half. Whole of lower half totally dull to percussion. *Diagnosis.*—Pulmonary consolidation, with pleurisy and hydro-thorax, right lung. Left lung healthy. Antipneumonic serum injected.

July 26.—Feeds moderately. Less nasal discharge. Mustard to both sides.

July 30.—Conjunctivæ injected. Respiration accelerated and slightly laboured. Coughs frequently; feeds fairly well; lies down. *Physical examination:* Right side, tubular breathing is audible over the upper half, whilst there is complete absence of sound over the lower half. To percussion upper half is resonant, lower half dull, though dulness has decreased both in intensity and in area since the 25th inst. Left side is normal, except for a small area of very doubtful dulness anterior lower fifth.

August 1.—Feeds well. Temperature subnormal. Conjunctivæ considerably improved. Lies down a great deal, and respiration slightly "stertorous."

August 3.—Pulse and conjunctivæ normal. Feeding well. No nasal discharge or submaxillary enlargement. *Physical examination* shows the following changes since the 30th inst.: Right side, lower half considerably more resonant to percussion, and vesicular murmur is now faintly audible in this area. Tubular breathing in upper half is less apparent. Left side continues normal.

August 7.—Progressing favourably. *Physical examination* shows great improvement, no abnormality being discernible.

August 11.—Favourable progress maintained. To have ten minutes' walking exercise. Ferri sulph. and nux vomica to be given in powder with food.

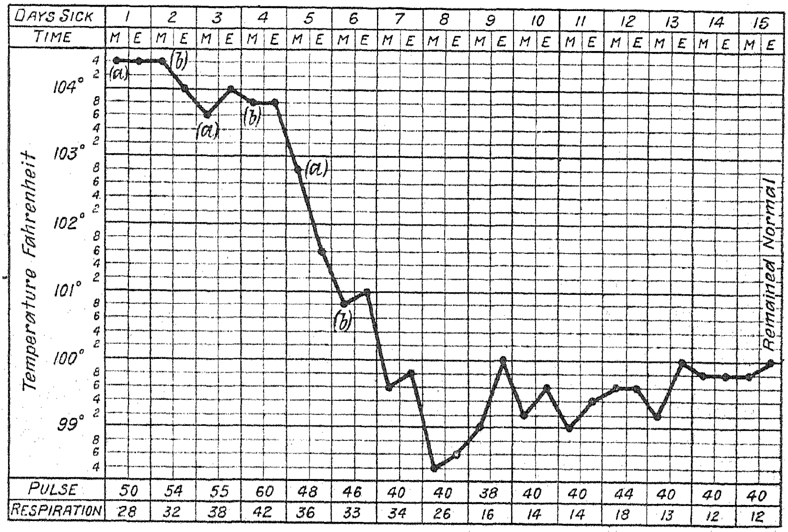
August 19.—There is very slight nasal discharge. Was not feeding well yesterday. Molars found to be sharp and irregular, and therefore rasped.

August 20.—Increased nasal discharge—bilateral, watery, mucoid.

August 23.—No change. Normal to physical examination of chest.

August 26.—Feeds well, and nasal discharge has ceased. Is in fairly good condition. There is a trace of submaxillary enlargement.

September 7.—No submaxillary enlargement. Has been having



CASE 7.—Officer's charger, Capt. S. J. C., mare, aged 4.
Treatment.—(*a*) 10 c.c. antipneumonic serum *A* by subcutaneous injection.
(*b*) 10 c.c. antipneumonic serum *B* by subcutaneous injection.

half an hour's exercise night and morning the last few days. Discharged cured, for very light duty.

CASE 8.—Officer's charger (Lieutenant W.); mare, aged 4.

Disease.—Pulmonary congestion and commencing pneumonia, with subsequent relapse and severe pleuro-pneumonia.

Treatment.—Antipneumonic serum (*a*) and (*b*). *Admitted*, August 18, *discharged* convalescent, November 6, 1910.

Admitted evening of August 18 with history of having had "a cold" and been "out of sorts" for two days. Respiration somewhat laboured. Much white, purulent, bilateral nasal discharge. Conjunctivæ slightly hyperæmic. Coughs. No enlargement of submaxillary glands. Feeding indifferently. *Physical examination: Auscultation,* great roughness (almost amounting to ronchi) over trachea. Vesi-

cular murmur distinct over upper two-thirds: inaudible over lower third, both sides. *Percussion,* dulness lower fourth, anteriorly, both sides (not marked, but slightly more pronounced right side.) *Diagnosis.*—Pulmonary congestion and commencing pneumonia (with questionable effusion?) both lungs. Mustard applied to throat, trachea, and sides. Mag. sulph. in drinking water. Pot. chlor. electuary, 10 c.c. antipneumonic serum (*a*) by subcutaneous injection. (For subsequent antipneumonic injections *vide* chart.)

August 20.—Feeding well. Copious purulent nasal discharge continues. Submaxillary glands distinctly enlarged, *Auscultation,* normal. Roughness over trachea has disappeared. *Percussion:* Dulness lower fourth both sides, less marked, scarcely perceptible. Heart-beat accentuated, but pulse normal.

August 25.—Progressing very favourably. Less nasal discharge. Feeding well. Submaxillary enlargement still present, and shows no change.

August 29.—Nasal discharge slightly increased. No change in submaxillary glands. Ung. hydrarg. biniod. to be applied to the latter. Physical examination of chest gives normal result. Accentuated heart-beat no longer apparent.

September 3.—No nasal discharge either yesterday or to-day; mare feeds well, and appears normal in every respect.

September 14.—Mare has shown no abnormality since September 3, and has apparently been convalescing favourably till last night, when temperature rose to 102·4° F. This morning it has risen to 104·8, and pulse and respiration are accelerated. No cough or nasal discharge, and submaxillary enlargement has practically disappeared. No abnormality to physical examination of chest.

September 15.—Not feeding so well; coughs; lies down a good deal.

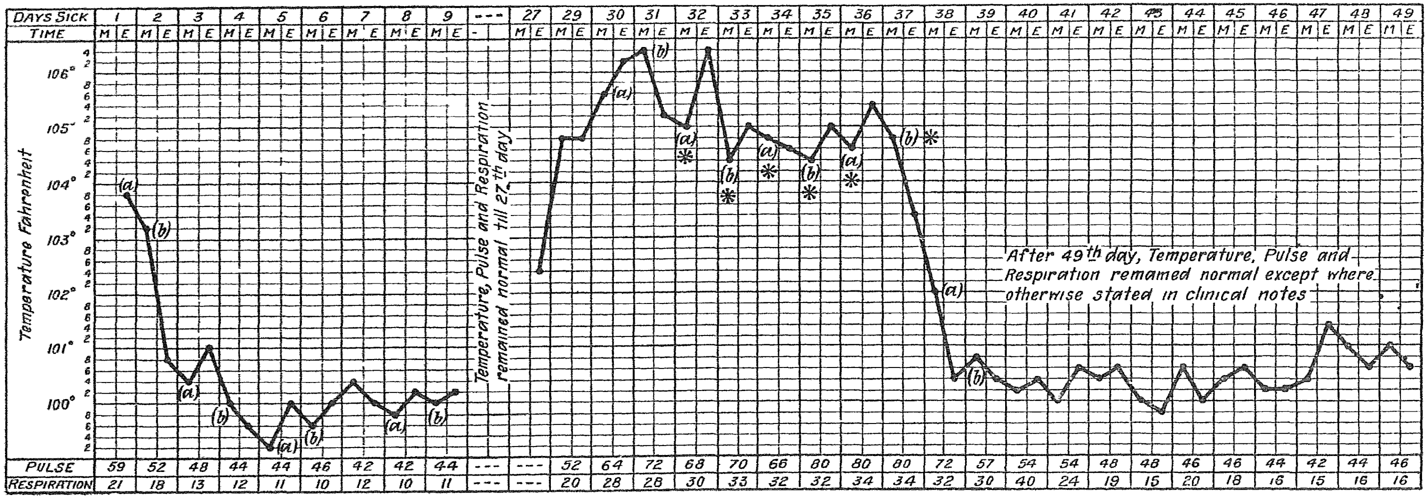
September 16.—Eats very little: looks depressed. Pulse weak and frequent. Mustard applied to sides.

September 17.—Feeding moderately. Slight whitish nasal discharge. Coughs. Respiration slightly laboured. Is in fairly good condition. Pulse better tone. Conjunctivæ normal. *Physical examination:* Front and left side normal, resonant to percussion and vesicular murmur loud and distinct. Right side, general slight dulness throughout, and an area of well-defined resonance about the centre. Vesicular murmur inaudible throughout.

September 20.—There has been no material change. Looks dull and feeds badly. Respiration laboured. Cardiac action rapid and weak. Conjunctivæ injected. Slight watery nasal discharge. General appearance unfavourable. Not heard to cough. Lies down.

September 21.—No change. *Physical examination* shows total dulness whole of right side except upper sixth, and vesicular murmur completely lost, the only sound being occasional patches of tubular breathing. Left side normal except slight (a questionable) dulness lower sixth. Front normal. *Diagnosis:* total consolidation of right lung (with pleurisy?).

September 23.—Feeding badly. Eats small quantity of green food and steamed hay, and drinks about a gallon of oatmeal gruel per day.) Respiration rapid, shallow and laboured, with much dilatation of nostrils. Coughs frequently. *Physical examination:* Front normal;



CASE 8.—Officer's charger, Lieutenant W., male, aged 4.

Treatment.—(*a*) 10 c.c. antipneumonic serum *A* by subcutaneous injection.
(*b*) 10 c c. antipneumonic serum *B* by subcutaneous injection.

* Double doses (20 c c. injected).

left side normal, though vesicular murmur appears somewhat "muffled." Right side the physical signs are very peculiar. A faint vesicular murmur, with crepitations, is audible. To percussion the greater part of the central region is hyper-resonant, a very hollow, drum-like note being obtained. The lower sixth of this side is dull, probably due to some effusion having collected here. The general appearance is unfavourable, both physically and subjectively, and prognosis bad.

September 24.—Feeds better. Conjunctivæ good. Pulse improved, but character of respiration is bad. Coughs. Lies down. No nasal discharge. *Physical examination:* Front and left side continue normal. Right side: faint vesicular murmur, with crepitations, is audible over greater part. The whole side is resonant, except lower sixth, but some patches more so than others. Hyper-resonance less marked. General condition, slight improvement. Strychnine gr. 1 subcutaneously, to be repeated daily. The mare is very weak.

September 26.—Feeding better, but very weak, and showed great difficulty in getting up after lying down. *Physical examination:* much the same as on 24th inst. Pulse and character of respiration show improvement. Conjunctivæ normal. Strychnine to be increased to gr. iss. per day.

September 30.—Feeling well and general appearance shows great improvement. Chest appears normal to physical examination, but cardiac rythm is most irregular, strychnine to be continued; also potass. iod. ʒiii. in drinking water night and morning with a view to possible tendency to preventing future laryngismus.

October 5.—Progressing favourably in every respect. Cardiac action more regular, and the mare is gaining strength. No abnormality is apparent on physical examination, but the submaxillary glands are still slightly enlarged on both sides. Marked muscular twitching about the triceps has been observed. As this may be due to the strychnia injections these are to be discontinued.

October 11.—Favourable progress maintained. Temperature and cardiac action normal; feeding well, and improving in condition. Muscular clonus referred to on 5th inst., no longer present. Respiration accelerated (is 20 to-day, was 18 yesterday, and 20 on 9th inst.), but physical examination shows no abnormality.

October 20.—Doing well in every way; respiration normal and has been so since 12th inst.

November 6.—Subsequent course favourable and uneventful. Is having half an hour's walking exercise, led, night and morning. Discharged convalescent.

Remarks.—The severe relapse that occurred in this case is somewhat remarkable. At the end of the first week it seemed evident that the threatened pneumonic invasion had been effectually cut short, but as subsequent events showed its onset had been merely postponed.

There can be no doubt that the attack was both virulent and determined, though to what extent the animal's defensive powers (whereby the disease was confined to one lung and a favourable issue resulted) were fortified by the action of the serum, can only be a matter for conjection.

Some of the physical signs evinced were far from clear. The area

of hyper-resonance observed on the right side on September 17 is difficult to account for, unless it was an instance of what is described in Taylor's "Practice of Medicine" (p. 410) as "skodaic resonance," which is said to occur over the upper part of the lung in cases of pleuritic effusion occupying the lower half or two-thirds of the chest. On September 21 the signs were classically indicative of complete hepatization of the right lung, but the peculiar phenomena referred to on September 23 seem impossible of explanation. It would appear, however, that they must have been in some way associated with commencing resolution, as it will be seen on reference to the chart that the temperature fell to normal that evening, and with one trivial exception remained so, whilst the pulse-rate fell from 80 on the 22nd to 57 on the 24th, and a process of slow, though uninterrupted, recovery ensued from that time.

CASE 9.—Officer's charger (Lieutenant G. B.); gelding, aged 5.

Disease.—Pleuro-pneumonia.

Treatment.—Anti-pneumonic serum (*a*) and (*b*). *Admitted*, August 20, 1910; *discharged*, convalescent, September 17, 1910.

August 20.—Reported sick, on account of being "dull and not feeding." No history of cough. No nasal discharge or submaxillary enlargement. Conjunctivæ congested. Respiration accelerated and laboured. *Physical examination:* Auscultation normal. Percussion shows fairly well-developed dulness lower fifth, right side. Anti-pneumonic serum injected, and mustard to chest both sides.

August 21.—Feeding badly. Appears very ill and dejected.

August 22.—Respiration greatly accelerated and marked dyspnœa. Feeds very indifferently. Pulse weak. Conjunctivæ congested. Coughs. No nasal discharge. *Physical examination* shows no definite change. There is an occasional "splash" audible over base of trachea. Vesicular murmur is somewhat indistinct, and there is a very slight dulness to percussion lower fifth, both sides. From the character of the respiration there is evidently much pulmonary hyperæmia.

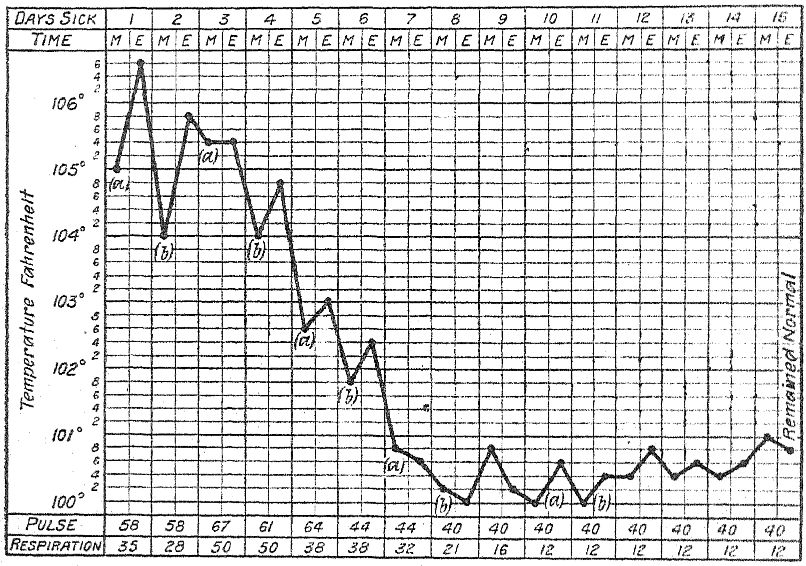
August 23.—No improvement. Feeds very badly. Pulse hard and weak. Coughs frequently. Conjunctivæ injected. Bowels normal. *Physical examination:* Vesicular murmur is audible lower half, right side, and some patches of well-defined tubular breathing are present about the centre. Lower half right side is totally dull to percussion. Left side is resonant, and vesicular murmur is audible, though indistinct, throughout. Constant and very pronounced "splash" over base of trachea. Respiration 50, and marked dyspnœa. All extra-respiratory muscles in play, and a peculiar clonic twitching of the intercostals is present. Remains standing up, in one position, with head down. General appearance bad, and prognosis unfavourable.

August 24.—Feeds better. No nasal discharge. *Physical examination:* Less "splashing" over trachea. Dulness on right side has increased both in area and in intensity, lower two-thirds being totally dull. Tubular breathing, as observed yesterday, is no longer apparent (this absence being due no doubt to pleuritic effusion). Vesicular murmur is audible over the upper third, but the lower two-thirds is devoid of sound. Left side remains resonant, and is normal to auscultation except that vesicular murmur is indistinct as compared with

the respiration rate. Physical signs show no improvement, though respiration is less accelerated; horse looks brighter, and subjective symptoms generally slightly more favourable.

August 25.—Slight improvement. Feeds better, but coughs considerably. *Physical examination:* Auscultation over trachea normal. Right side, vesicular murmur distinct, and normal over upper third; inaudible over lower two-thirds. To percussion, if there is any change at all, the dulness over lower two-thirds is a trifle less marked. Left side continues normal. Conjunctivæ congested. Heart action and pulse satisfactory, and general condition fairly favourable.

August 27.—Improvement maintained. Feeding well, and general



CASE. 9.—Officer's charger, Lieutenant G. B., gelding, aged 5.

Treatment.—(*a*) 10 c.c. antipneumonic serum *A* by subcutaneous injection.
(*b*) 10 c.c. antipneumonic serum *B* by subcutaneous injection.

appearance satisfactory. Physical examination shows improvement on right side. Vesicular murmur is faintly audible over the lower two-thirds, and the dulness in this area is decidedly less. No nasal discharge or submaxillary enlargement.

August 29.—Progressing very favourably, and physical examination shows great improvement. Vesicular murmur is now clearly audible throughout the whole of right side, and the dulness to percussion has almost completely cleared up.

September 2.—Feeding well and progressing favourably in every way. Pulse occasionally intermittent.

September 7.—Favourable progress maintained. Coughs occasion-

ally, and there is an occasional cardiac intermittence. Otherwise normal in every way. No abnormality is discernible on physical examination.

September 17.—Subsequent course favourable in every respect. Discharged convalescent.

NOTES ON A HUMAN TRYPANOSOME TRANSFERABLE TO ANIMALS IN NORTHERN RHODESIA.*

By L. E. W. BEVAN, M.R.C.V.S.

Salisbury, Southern Rhodesia.

Source of Virus.

The virus used to originate the strain of human trypanosomiasis at this laboratory was obtained from an European who, arriving in Southern Rhodesia from the north in November last, was found to be suffering from trypanosomiasis. This case was of considerable interest, inasmuch as there appeared grave reason to suppose that the patient had contracted the disease in Northern Rhodesia in an area thought to be free from *Glossina palpalis*. In these circumstances it became a matter of grave importance to determine the identity of the trypanosome with which he was infected and the manner of its transmission in nature.

Transmission through Animals.

A supply of blood having been obtained by the courtesy of Dr. Heygate Ellis, of the Medical Department, a number of laboratory animals were inoculated, and among others, sheep and a mule. The facility with which these latter became infected opened up the question as to the part played by the lower animals in connection with human trypanosomiasis in nature. Shortly after these experiments commenced it was announced that Bruce † and his colleagues working in Uganda had found that cattle in the "fly area" (*G. palpalis*) did naturally harbour *T. gambiense* — a discovery which rendered the study of sleeping sickness a legitimate branch of work in a veterinary laboratory.

The results obtained here have been of some interest and have shown that not only are some of the domestic animals readily susceptible to this human trypanosome, but that artificial inoculation

* Since this article was written we have received a cablegram from Mr. Bevan saying that the trypanosome has been definitely identified as *T. vivax*. (See p. 2.)—Eds. *V.J.*

† The communication by Bruce and others on this subject will be reproduced in the Veterinary Journal for February.—Eds. *V.J.*

gives rise in them to symptoms no less severe than those caused by infection with the animal trypanosomes.

It has been possible to keep under observation at the same time sheep inoculated with the so-called *T. dimorphon* of North-Western Rhodesia and the animal trypanosome of these territories, and it has been found that the disease arising in sheep inoculated with the human trypanosome has been more acute and characterized by more severe symptoms.

Similarly a mule offered no resistance to a single inoculation with the human parasite which produced a far more severe reaction than the animal trypanosome of Southern Rhodesia to which equines appeared to possess a marked resistance.

Virulence of Strain.

From an examination of charts of sub-inoculated animals it would appear that the strain is of quite exceptional virulence—an observation which coincides with the experience of those Medical Officers who have studied the disease in human subjects in the field.

Compared with the recorded results of previous experiments with *T. gambiense*, the period of incubation and the duration of the disease appears to be unusually short, as indicated by the following averages :—

Animal	Average period of incubation	Average duration of disease
Rabbit	7 days	24 days
Guinea-pig	8 ,,	38 ,,
Rat	$5\frac{1}{2}$,,	36 ,,
Mule	6 ,,	About 100 days
Sheep...	6 ,,	47 days

The above figures are only approximate, as in some animals the course of the disease has been modified by treatment, and the intensity of the virus has been altered from time to time by passage through various species of host. In sheep severe infection is not always associated with the appearance of trypanosomes in the peripheral blood, and the period of incubation can then only be based upon the first definite elevation of temperature.

Symptoms.

In most cases the disease runs an acute course, or, after a preliminary stage when symptoms have not been well marked, has

terminated by crisis. In rabbits and sheep there is a remarkable œdema of the face, especially that part situated between the eyes and nostrils. The photographs* give a good idea of the characteristic appearance presented. In other trypanosomiases œdema at the base of the ears and around the nose occur, but the extent and situation of the swelling in these cases appear to be exceptional. In those sheep which have shown no other symptoms save the irregularly elevated temperature, and where trypanosomes have not been found in the peripheral blood, the swelling of the head has enabled one to recognize infection. If this symptom holds good, in natural circumstances it should assist in the detection of "reservoirs" in those areas where prophylactic measures are being adopted. An elevated temperature has also been present in all cases, but examination of a large number of charts does not reveal any characteristic thermal wave, nor has it been possible to recognize any relation between temperature and the appearance of trypanosomes in the peripheral blood. In sheep, for example, the disease may run its course without any parasite being detected in the blood, although a small quantity used for the subinoculation of rabbits will give rise to an infection characterized by an abundance of trypanosomes in the blood.

HUMAN TRYPANOSOMIASIS.

Subject : Black sheep with lamb at heel.
Virus : 3 c.c. warm citrated blood from brown buck rabbit.
Date of inoculation : August 2, 1910.

Date	Temp.	Remarks
Aug. 3 ...	102·4	
,, 4 ...	103	
,, 5 ...	104·5	
,, 6 ...	105·2	
,, 8 ...	104	
,, 9 ...	102·6	
,, 10 ...	104·8	
,, 11 ...	104·8	
,, 12 ...	104·4	Rabbit inoculated with 2 c.c. blood.
,, 13 ...	104·8	
,, 15 ...	105·8	Above rabbit shows trypanosomes.
,, 16 ...	105·8	
,, 17 ...	106	
,, 18 ...	106	
,, 19 ...	105·4	
,, 20 ...	105·8	
,, 22 ...	105·8	
,, 23 ...	106·2	Above rabbit dead.

* No photographs were received with the article.—EDS. *V. J.*

Date.		Temp.	Remarks.
Aug. 24	...	105	Œdema of throat. Typical swelling of head.
,, 25	...	105·8	
,, 26	...	106	
,, 27	...	106	
,, 29	...	105	
,, 30	...	105	Very ill. Œdema of head and neck.
,, 31	...	104·8	
Sept. 1	...	102·4	
,, 2	...	...	Dead.

Trypanosomes never found in peripheral blood.

In one or two rabbits somnolence has occurred, and in some of the sheep brain symptoms have predominated during the last few days.

In other respects the symptoms are those common to animal trypanosomiases.

Identity of the Trypanosome.*

It has been suggested that the human trypanosome of Northern Rhodesia may not be *T. gambiense*, but some animal trypanosome (*e.g.*, *T. brucei*) habituated by the method of transmission or passage to the human host. This possibility has been borne in mind since the commencement of experiments at this laboratory, and from time to time material has been sent to experts in Europe with the view to establishing the identity of the parasite.

Morphology.—The endeavour has been made to classify the parasite by careful study of its morphology, but up to the present no features have been detected which would justify one in differentiating it from *T. gambiense;* moreover, it has been felt that the utmost caution should be taken in this respect, inasmuch as the too hasty announcement of the discovery of a new trypanosome pathogenic to man would naturally cause considerable alarm and economic loss in these countries threatened by its invasion.

Minchin, in a "Note on the Polymorphism of *Trypanosome gambiense*" ("Parasitology,"vol. i., No. 3, p. 326), recognizes three typical forms of this trypanosome when a blood-smear is fixed with osmic vapour, stained with Giemsa's stain and mounted with Canada balsam. He claims that "the difference between the three forms is by no means one merely of size," and recognizes :—

(1) A slender form of great length and having a very long free flagellum.

* (See footnote, p. 41.)

(2) A stumpy form which is short, the flagellum of which is also very short, especially the free portion.

(3) The ordinary form more or less intermediate between the two extreme forms.

The human trypanosome which, although passed through animals in this laboratory, has retained its morphological characteristics, exhibits in most cases specimens of the three types described in Minchin.

The *prevailing* type, of which the long and short forms appear to be derivatives, may be described as follows:—Average total *length*, 26-38 μ; average *width*, 1·7 to 2·25 μ; *micro-nucleus*, about 1·25 μ from posterior extremity; *posterior extremity*, a truncated cone, the apex lying to the side of the median line; *macro-nucleus*, longitudinal ovoid, 4 to 6 μ long, posterior edge about 7 μ from the posterior end of the parasite; *undulating membrane*, well developed and highly festooned (five or more folds); *flagellum*, fine with free portion about 7 μ long.

Some specimens show granules, and in some there is an area which stains only faintly anterior to the micro-nucleus.

The *long* form has its posterior extremity drawn out into a "beak," its body is narrower, the macro-nucleus is elongated, and the free flagellum may measure up to 12 μ or longer.

In the *short* forms the posterior extremity is shorter and the micro-nucleus may be terminal. The macro-nucleus is round or slightly oval, and is situated centrally or slightly posterior to centre. The parasite is broader than the other types. The flagellum has little or no free portion.

Another type is frequently met with, especially in animals about to die. It is of the long or medium type, but stains faintly, the undulating membrane and flagellum being very inconspicuous.

Parasites undergoing degeneration or division, or altered or distorted in the preparation or staining of the smear, frequently present unusual appearances, and may be seized upon as evidence of a new species. Too much importance should not be attached to such irregularities until various methods of technique have been employed to determine whether they are proper to the parasite or merely artifacts.

Atoxyl Resistance.

It has been stated that the trypanosome of Northern Nigeria and Nyassaland is remarkably resistant to atoxyl, a contention which is brought out by the following experiment:—

Subject :—Ewe (large brown fat-tail).

Oct. 31 ,1910, 10 a.m.—Received intravenously 1 gm. atoxyl in aqueous solution.

Oct. 31, 3.30 p.m.—Received subcutaneously 10 cc. citrated blood of lambs, No. 3, suffering from human trypanosomiasis.

Nov. 1, 10 a.m.—Received intravenously ½ gm. atoxyl.

Nov. 2.—Received subcutaneously 5 c.c. citrated blood of lamb No. 3.*

Nov. 10.—1 c.c. of this ewe taken and injected at once into rabbit.

Later.—Received 1 gm. atoxyl.

Nov. 16.—Above rabbit showing trypanosomes.

Nov. 18, 5 p.m.—Above rabbit died. Blood containing average 25 trypanosomes to the field

Nov. 21.—Sheep showing marked clinical symptoms.

The experiment would appear to indicate that atoxyl is useless as a preventive against this trypanosome, which can establish itself in a host previously saturated with the drug. Further, the parasite recovered from the treated animal appears to have increased in virulence.

Trypan-blue.—The trypanosome also appears highly resistant to trypan-blue, as is shown by the following experiment :—

Subject : Ewe No. 5.

Virus : 2 c.c. warm citrated blood from black ewe.

Date : August 29, 1910.

Result : Temperature and clinical symptoms showed infection. Trypanosomes also found in blood, September 16, 1910, September 28, 1910, and October 7, 1910.

October 17.—Animal apparently dying. Blood taken and inoculated into control rabbit No. 1. Later, received intravenously 100 c.c. of 1½ per cent. solution trypan-blue.

October 18.—Animal still very sick, intensely stained ; 1 c.c. blood taken from ewe and inoculated into control rabbit No. 2. Later, received 10 c.c. of 10 per cent. solution of atoxyl, intravenously.

October 21.—4 c.c. blood taken (seventy-six hours after injection of atoxyl) and injected into control rabbit No. 3.

October 29.—Ewe died.

Control rabbit (No. 1)	Control rabbit (No. 2)	Control rabbit (No. 3)
Oct. 22. Trypanosomes seen Oct. 26. Died after bleeding	Oct. 22. Trypanosomes seen Nov. 1. Died	Nov. 16. Still alive Trypanosomes never seen

* The strain recovered from lamb No. 3 has not been rendered atoxyl-resistant by artificial means, but has been shown by other experiments to be temporarily affected by the exhibition of the drug.

Post-mortem examination of ewe showed well-marked staining of the tissues with blue. The meninges were highly coloured, *but the brain itself was not stained.*

Various methods of treatment, both with drugs and sera, have been tried, but up to the present no successful results have been recorded. No case of natural recovery or immunity has been encountered; those animals which have appeared resistant or tolerant have eventually succumbed.

It has frequently happened that the exhibition of an agent of low parasitotropic, but high organotropic properties to an animal in which the disease is running a normal course has brought about crisis. The use of drugs in unsuitable doses has produced similar results.

It may be mentioned that experiments have been conducted which have proved that the tissues of a fœtus of a highly infected mother are not infective; also that the milk of an infected ewe does not convey infection to the lamb feeding upon it, or to animals artificially inoculated with it. Lambs feeding upon such milk derive no immunity therefrom.

THE NINTH DAY IN THE COVERING OF MARES AND THE DURATION OF PREGNANCY.

By MIECKLEY.

Beberbeck.

THERE are no scientific experiences as to what day during the time of œstrum is the most favourable to have a mare covered. The readiness for the stallion ceases between the seventh and ninth days after the beginning of œstrum. It is considered best to cover the mare on the second or third day of the heat and to repeat the jump on the fifth and seventh days. It is not right to adopt the old custom of leading the mare to the stallion again the ninth day after she has been once served.

In Beberbeck, in 1910, the average duration of pregnancy (72 births) was 329 days; the shortest pregnancy 314 days, the longest 347 days. The text-books give the extremes of 310 and 410. The popular view that longer pregnancies occur with colt foals than filly foals was not always found to be correct. The average minimal and maximal times in other studs were: Repitz, 338, 319, 367; Trakehnen, 329, 305, 347; Bejohrgallen, 329, 311, 347; Gurdzen, 329, 306, 346; Danzkehmen, 331, 308, 343; Jonasthal, 327, 315, 344; Georgenburg, 331, 311, 360; Neustadt (Posse) 326, 313, 343.

(*Deutsche Tierärzt. Woch.*)

Clinical Articles.

NOTES ON THE CASTRATION OF CRYPTORCHIDS THROUGH THE FLANK.

By E. C. WINTER, F.R.C.V.S.,
Limerick.

For some time now I have been operating on cryptorchids through the upper flank, and the results have, I think, justified the departure from the usual mode of procedure. I have in all operated in this way on twenty-five horses from two to nine years old, and have lost three—one from peritonitis, one from septicæmia, and one which died under chloroform before the operation had commenced. The others all did well, but in two of these cases I failed to remove or find the gland, as well as in the peritonitis case above mentioned. My mode of procedure is to physic and starve the patient for forty-eight hours to get the bowels empty, giving an enema an hour before operating. The horse is cast and chloroformed, and the skin over the seat of operation shaved and rubbed with iodized chloroform. The incision is made where the curl is in the hair, in front of and below the point of the hip, first through the skin, vertically, then through the two layers of muscle, diagonally (not cutting the striæ, but dividing them with the fingers or a spatula) each layer in a different direction. A towel soaked in antiseptic fluid is then wound round the wrist and pressed against the flank to exclude air, and the peritoneum broken through with the finger nails. If the testicle is not found at once I always look for the origin of the cord behind the kidney and traction on this soon finds it. If possible, I get the gland outside and remove it with the "Reliance" castrator, if not, I pass in an écraseur and remove it that way. I find it quite sufficient to suture the outer layer of muscle with three independent sutures, and about a similar number in the skin, and then paint the wound over with collodion. Healing usually takes place by first intention, and the wound rarely gives trouble. Where I have sutured the internal layer of muscle I have found the sutures buried after three or four days and have left them; I never suture this layer now, as I find it is not necessary and the sutures act as irritants. Nine out of ten patients never miss a meal afterwards.

The precautions to be observed are the starvation mentioned above, proper antiseptic precautions during the operation, and careful feeding afterwards.

The cicatrix in the scrotum generally shows where one testicle has been removed, and having found this, the operation is performed on the flank of the other side. This operation is, of course, contra-indicated where the testicle is in the canal. In one case I could find no trace of a testicle, and thought I found a cord under the psoæ muscles extending back over the bladder, but, finding a similar one on the other side, I concluded that they were the ureters. The horse died four days afterwards, and I found two small testicles between the neck of the bladder and the rectum. The other two cases in which I failed to find the testicle did well and were subsequently sold, and I am quite certain the glands were not in the abdominal cavity, although the horses behaved like rigs, and must have been such. Each had been purchased at two years old, and there was no history to be had.

One of my successful cases was a case of hypospadias in a cryptorchid two years old. This animal had a vulva between the thighs just behind the udder, from which it could protrude a penis, and one testicle was outside the vulva, whilst the other was close to the kidney suspended by a short cord.

NOTES ON THREE CASES OF BROKEN WIND.

By R. W. MELLARD, M.R.C.V.S., Lieut. A.V.C.
Mhow, India.

THREE cases of broken wind occurred in Mhow, Central India, in the following animals, rendering them incapable of work during the rains (June to September), 1909:—

(1) Roan waler mare, trapper, 15 hands high, aged 14.

(2) Chestnut waler gelding, polo pony, 14·2 hands high, aged 12.

(3) Bay waler gelding, charger, 16 hands high, aged 9.

Throughout the previous hot weather, 1909, these horses had frequently suffered from slight coughs, which had in no way interfered with their work except that the cough was occasionally noticed when first coming out of the stable in the morning.

The period when the broken wind (double flank movement and dyspnœa, &c.) first became noticeable was after the rains had been on for about a fortnight or three weeks, and these horses had been eased considerably in their work and were allowed out daily grazing for two or three hours, so that a very large proportion of their food was green grass. During the hot dry weather they had received no green food, their hay, as is usually the case in India, was very dry, dusty, and

contained a large amount of woody fibre through being cut too late, and in fact everything as regards diet and climate was unfavourable for a broken-winded animal, yet they continued to do their work satisfactorily, and it was only in the rains that they became more or less incapable of doing even slow work.

So soon as the rains were over in 1909 and the weather became hot and dry again and their diet was of a very dry nature (corn and hay) they gradually improved, and within two months the only remaining symptom of the broken wind was the slight and sharp hoarse cough, always more prevalent first thing in the morning when taken out of the stable.

All the three horses worked regularly during the cold and hot weather of 1909-10 until the rains of 1910 when the broken wind occurred.

No. 1, the trapper, was now extremely bad, and became much distressed if only walked a few yards. She was destroyed in August, 1910, and the *post-mortem* examination showed extensive emphysema of both lungs.

No. 2, the polo pony, was fairly bad this year and quite incapable of doing fast work, but since the weather has become warm and dry again there has been a marked improvement and the pony will probably work well as long as the weather is dry and warm.

No. 3, the charger, was sold out of the station and I regret I was unable to get any further record of the case.

A common symptom in all these cases was that whenever there was a break of four or five days fine weather during the rains the dyspnœa became very much less.

I considered these cases worth recording for the following reasons :—

(1) Instances of broken-winded animals doing much better on very dry food than a liberal diet of green food.

(2) Symptoms were very much regulated by state of climate (much worse in wet than dry weather).

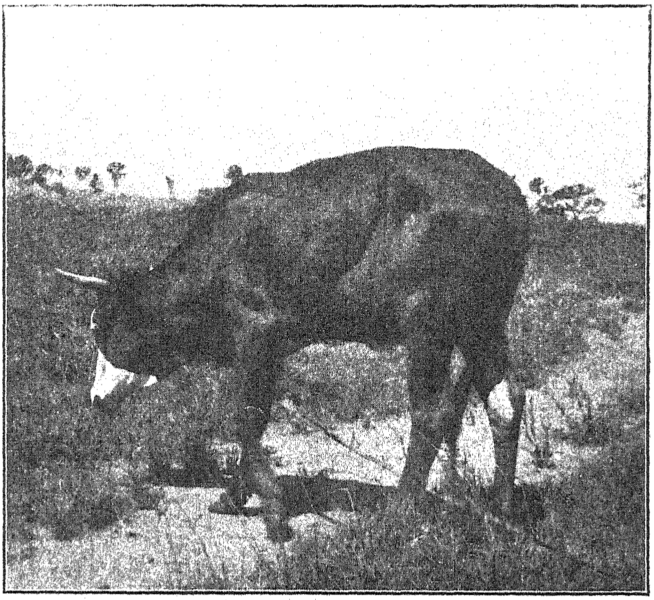
(3) Cases of broken wind I had seen at home had always been the reverse of the above.

EPHEMERAL FEVER.

By FRANK CHAMBERS, M.R.C.V.S., G.V.S.
Umtata, South Africa.

THE accompanying photograph shows a cow suffering from ephemeral fever, or (three days' sickness) a disease affecting cattle, which was so admirably described by Veterinary Surgeon Freer, of Uitenhage, C.C., in an issue of the VETERINARY JOURNAL early in 1910.

The chief features to be noted from the photograph are the stiff and tucked-up appearance of the animal. In the outbreak during



Animal affected with Ephemeral Fever.

which this cow was affected, seven cows died as the result of drenching, whilst those which were left alone recovered.

[The excellent article by Mr. Freer, referred to above, appeared in the issue of the VETERINARY JOURNAL for January, 1910. In the course of it Mr. Freer also remarked on the two points referred to by Mr. Chambers. He likened the general appearance of an affected animal to "the wooden cow we obtained from the top shop in our early youth," and with regard to treatment he said, "the less the patient is interfered with the better will be the results."—EDS. *V.J.*]

BELL'S PARALYSIS IN A HEIFER CALF.

By T. G. PALGROVE, M.R.C.V.S.
Department of Agriculture and Stock, Sydney, New South Wales.

WHEN visiting the Wagga Experiment Farm, New South Wales in May last, Mr. George Lee, the dairy instructor, there drew my attention to a six-months-old Jersey heifer calf, which on examination appeared to me to be suffering with Bell's paralysis.

It may not be out of place to summarize here the generally accepted theories regarding this condition before proceeding to an account of the case itself, especially as most authorities are agreed that cattle seldom are affected with the disease.

Bell's paralysis is generally due to injury to the facial nerve, which supplies motor power to the muscles of the ears, eyelids, nose, lips, and cheeks—such injury generally being external in nature, such as a blow, and impairing the conductive power of the nerve. The disease may also occur as the result of severe chill, or may arise during the progress of influenza or petechial fever, the development of a melanotic tumour in the parotid gland, or the presence of an excrescence in the Fallopian canal may cause pressure on the facial nerve with impairment of function as a result.

The facial nerve arises from the pons, enters the inner ear, passes through the Fallopian canal and outwards through the stylomastoid foramen of the petrons temporal bone, penetrates the parotid gland, and then passes over the posterior border of the lower jaw on the external surface of which it divides.

The three following portions may be enumerated according to their points of origin :—

(1) In the Fallopian canal arise: (*a*) A nerve for the stapedius muscle; (*b*) A nerve to the chorda tympani.

(2) At the stylomastoid foramen arises: (*a*) The posterior auricular nerve; (*b*) The middle auricular nerve.

(3) Following the course there arises: (*a*) Nerve to the occipito-styloid, stylo-hyoid; and digastric muscles; (*b*) The zygomatico-temporalis nerve, which gives off: (i.) The anterior auricular nerves; (ii.) branches to the temporalis muscle; (iii.) branches to the orbicularis palpebrarum; (*c*) The cervical branch, giving off twigs to the depressor of the ear, the superficial cervical muscles, and afterwards passing over the external surface of the lower jaw and supplying the muscles of the nose, lips, and cheeks as a motor nerve.

It will be seen that for a portion of its course the facial nerve is exposed to the chance of injury from external causes. The symptoms

exhibited by the subject were ptosis of the left eyelid (superior), left side of lower lip pendulous and twisted outwards, constant dribbling of saliva from the left side of the mouth, complete drooping of the left ear, loss of power of the muscles of the left eyelid, ear, and left side of lower lip, and general loss of condition.

I could not detect any signs of impaired hearing, neither could I find any appearance of neuritis. There was no evidence of any swelling such as would be expected as a result of the inflammatory exudate poured out when the nerve and its neurilemma are inflamed, neither was there any evidence of pain on pressure over that portion of the nerve which lies on the exterior of the lower jaw.

Owing to the absence of any evidence of external injury, and also to the likelihood that the zygomatico-temporalis nerve was affected, as evidenced by the ptosis, drooping ear, and inability to close the eyelids, I considered that the lesion was probably in the proximal portion of the course of the nerve.

The treatment consisted of the application of a blister consisting of one part of biniodide of mercury (red) to four parts of lard, round the base of the left ear, across the poll, and along the course of the nerve on the left cheek.

The case was then left in Mr. Lee's hands with instructions to keep the bowels open by means of Epsom salts, give any nourishment that the subject could and would take, and remove the blister after a period of four days by means of a little sweet oil.

On my next visit a fortnight later, I found considerable sloughing of the skin round the base of the ear, and a slightly improved condition of the lower lip and eyelid, each having regained the power of movement in a slight degree. The left ear still remained pendulous.

I was unable to see the case for another month, and then found that the ptosis was almost gone, the lower lip had recovered a good deal of its motive power, and the left ear was not drooping to anything like the former extent; also the general condition of the subject was improving. There was a steady improvement maintained, and in a further two months' time all traces of the condition had disappeared and the subject was in good health again, a result largely due to the care with which Mr. Lee nursed the case. The case is an interesting one partly because Bell's paralysis is a rare condition amongst cattle and partly on account of the duration of the case—four months—from first observation to ultimate recovery.

As a general rule cases of this nature either recover more quickly or not at all.

The points that struck me more particularly in connection with the case were: (*a*) the absence of any evidence of external injury either by blows or pressure; (*b*) the complete absence of neuritis; (*c*) the well-marked ptosis; (*d*) the remarkable dropping of the left ear; (*e*) there was no falling-in of the left nostril.

I have often heard it suggested that a blister is useless in such cases, but in this one it was certainly efficacious. Possibly in some cases the blister used has not been of sufficient strength.

FOALING CASE—RUPTURE OF UTERUS DURING FOALING.

By E. F. J. BORDEAUX, G.M.V.C.
Melbourne, Australia.

THE subject was a heavy draught mare, weighing about 15 cwt. This mare was due to foal, and had shown colic pains for two days before I saw her. She had also been straining at intervals. When I examined her, the temperature was 101° F., pulse and mucous membranes normal, appetite good. The milk was pouring out of the teats, and the hocks were soiled by sanious fluid. The cervix uteri was fully dilated, but the uterus was empty, except for a small quantity of fluid normal in appearance. Under the uterus the foal could be distinctly felt. I searched carefully for a rupture, but could find none. The right cornu, which had evidently contained the foal, was explored as far as the arm could reach, but nothing abnormal could be detected. The examination produced no irritation, and no straining followed; the mare started grazing as soon as released. I told the owner the case would prove fatal, and offered to open the abdomen, under chloroform, but he refused, preferring to let the mare "take her chance." He promised to inform me when death took place. The mare died about forty hours later.

Post mortem.—The abdominal cavity was filled with fluid, probably a mixture of placental fluid and exudate, which was dark in colour and had an offensive odour. The foal contained in the placenta, which was ruptured in one place, dropped out with the intestine, when the abdominal wall was opened, also two reddish blood clots representing about two quarts. The right cornu of the uterus was ruptured inferiorly at the extremity, the opening appearing hardly large enough for the foal to come through. The edges of the rupture were irregular and jagged, but the muscular wall of the uterus did not appear thinner than usual. This mare had foaled twice previously, and was only eight years old.

Abstracts and Reports.

THE DESTRUCTION OF RATS.

Two kinds of rats are found in Great Britain, the black rat (*Mus rattus*), and the brown rat, sometimes called the Hanoverian or the sewer rat (*Mus decumanus*). The former, which has been longer established in this country, is the smaller of the two. It is more lightly built, but its ears are slightly larger and it has a thin tail eight or nine inches long, or about an inch longer than the rest of its body. The upper part of its fur is of a grey-black colour, the under parts being a dark grey. The brown rat is generally longer in the body, but shorter in the tail, which is never as long as the head and body combined. It has a blunter muzzle, and its fur is grey-brown above and white below. The fur of the brown rat, moreover, is rather coarser than that of the black rat.

The females of both species breed at a very early age, and though they go with young for six weeks they have several litters in the year, each litter comprising from six to fourteen young. Rats therefore increase in numbers very rapidly if sufficient food is available. It has been calculated that in India, where they breed all the year round, the offspring of a single pair would, if supplied with sufficient food and left unchecked, amount at the end of one year to thirty-five thousand. Fortunately such favourable conditions are never present.

Rats are omnivorous feeders, and when desperate with hunger are even cannibals, but they are by choice dependent on the food supplies which man prepares for himself and his domestic animals, or on the waste of such food. Many estimates have been made of the damage done by the rat population of Great Britain in a single year, but as these estimates are based on the assumption that the supplies consumed by rats would otherwise be available for human use or consumption the reasoning is unsound. It is, however, generally admitted that the damage done is incalculable. Rats frequent dwelling houses (generally only the lower floors), barns, granaries, poultry yards, slaughter houses, sewers, and other places where food supplies are stored, or the waste is thrown away. They also frequent rabbit warrens, and take to the fields when food is to be found there, returning to shelter and to breed in corn stacks in the autumn.

Apart from the food consumed by rats, much damage is done to buildings, floors, and other kinds of woodwork from their power of gnawing holes and passage ways. It is also known that the disease called plague may be spread to human beings by fleas from infected rats.

It is, therefore, highly desirable, both from an economic and a sanitary point of view, that rats should as far as possible be destroyed. It would, of course, be well if they could be entirely exterminated in Great Britain, but this is practically an impossibility. During the period of nearly two hundred years that has elapsed since the brown rat was introduced into this country, it has penetrated to the remotest parts of the British Islands, and is to be found in many ruined build- and other places from which it would be difficult to dislodge it. Since

rats can live on garbage, travel over wide areas, and breed very rapidly, a few pairs allowed to remain alive would quickly re-stock the country, and even if every rat were destroyed, others would undoubtedly be imported in some of the vessels that call at English ports. The expense and inconvenience of exterminating the rat population of this country and preventing re-importation would far outweigh the economic gain to be secured by their destruction.

The destruction of rats is essentially a matter for local effort, and the occasion for the attempt to be made is when the danger of injury from their presence outweighs the probable cost and trouble of killing them. Local effort, however, does not necessarily mean isolated or unsystematic effort. In many places it is true that rats can be kept down by cats, traps, and occasional rat hunts, and this is true of most dwelling houses, especially if the kitchen and outhouses are kept in a clean and tidy state so that the rats find it difficult to procure an abundance of food. It is also true of many farms where the buildings are well kept, but in other cases on farms, or in mills, malthouses, and other establishments where large supplies of food are stored, especially where several such buildings stand close together, combined effort is essential. In these cases the formation of a rat club such as is described in Leaflet No. 84 is desirable. It is customary in such cases for all the large occupiers of land in a given district, generally comprising several thousands of acres at least, to offer a small reward for every rat killed within the district, the tail being produced as a proof of slaughter. Occasionally, however, it happens that for sanitary or other reasons, especially when rats have been allowed to breed undisturbed for a long time, it is considered important to attempt the extermination of rats over a much wider area, and in this case a more elaborate organization is required. The following observations and suggestions may be found useful to those who propose to organize such a campaign.

There are three methods which may be employed in the destruction of rats: (1) hunting; (2) trapping; (3) the use of poison or rat virus. There is not much to be said about the first of these methods. Most residents in the country are acquainted with the ratting instinct of terriers, and with the employment of ferrets, and a knowledge of the practice can better be obtained by experience than by description. As regards traps, the spring trap which kills the rat at once when the spring is released is the best, but care must be taken to see that no other animal is caught, and traps should therefore be visited frequently. Another kind is the wire trap, on the eel-basket principle, which the rat can enter easily when attracted by the bait but cannot leave.

Rat poisons are sold in all country towns by chemists, and several patent or proprietary poisons are advertised in agricultural and other newspapers. They are generally composed of phosphorus paste or arsenic, but strychnine may also be employed, while the use of barium carbonate has also been recommended. A recent bulletin published in the United States Department of Agriculture discusses the relative merits of arsenic, phosphorus, strychnine, and barium carbonate as rat poisons. *Arsenic* is cheap, and perhaps the most popular poison for the purpose, but experiment showed that, measured by the results obtained, it is dearer than strychnine. It is variable in its effects. One part of arsenious acid may be mixed with twelve parts by weight

of oat or maize meal and made into stiff dough with white of egg. *Phosphorus* is almost as commonly used as arsenic, and is effective when used in an attractive bait; but in the paste forms, which contain from 1 to 4 per cent. of yellow phosphorus in glucose and other substances, the lower percentage is too small to be always effective, and the larger amount is dangerously inflammable. Many fires have been caused by phosphorus paste in the United States, and the Biological Survey does not recommend its use. It is said that there is no foundation in fact for the statement that phosphorus dries up or mummifies the body without odour when eaten by rats or mice. *Strychnine* may be effectively employed in the open and round farm buildings, but it is too rapid in its action for use in houses as the vermin would die on the premises. Dry crystals of strychnia sulphate may be inserted in portions of raw meat, sausage, or fish, and these placed in the burrows. Strychnine syrup may be prepared by dissolving ½ oz. of the sulphate in one pint of boiling water and stirring in one pint of thick sugar syrup; this may be used to moisten a bait of oatmeal, while wheat or maize may also be soaked in it. In all cases it is advisable that baits containing one of the above poisons should be obtained ready prepared from a pharmaceutical chemist. *Barium carbonate* is considered one of the cheapest and most effective poisons for rats and mice. It is without taste or smell, has a corrosive action on the mucous lining of the stomach, and, causing thirst, induces the vermin to seek water in the open, where they die. In the small doses used it is said to be harmless to domestic animals. It may be employed in the proportion of one part of the carbonate to four parts of meal, mixed to a dough with water. A convenient bait is composed of one part by measure of the mineral to eight parts of oatmeal, mixed to a stiff dough. The carbonate may also be spread on fish or moist toasted bread. In 1905 large quantities of a poisonous food were sent out by the Agricultural Botanical Institute at Munich for the purpose of destroying field mice, and it is stated that it chiefly contained barium carbonate. Plaster of Paris is sometimes used mixed with flour, which sets into a hard mass in the rat's stomach. It must be remembered that rats are very suspicious, and if they find that any number of their fellows die after eating any kind of food they will avoid such food for some time. It will be as well, therefore, to vary the form and appearance of the poisoned bait at intervals. Thus, after using poisoned bread for a while, oatmeal similarly treated should be used.

Apart from the risk of possible prosecution under the Acts which deal with the use of poisoned grain, meal, or meat, it is very necessary when using poisons to take precautions to avoid injury to other animals and human beings. (The Acts concerned are the Poisoned Grain Prohibition Act, 1863, and the Poisoned Flesh Prohibition Act, 1864.)

In any case poisoned baits should only be laid by authorized and responsible people. Their whereabouts should be carefully recorded, and they should be visited regularly and destroyed if not taken within a short period. The strictest precautions should be taken to prevent the bait being eaten by domestic animals, and if necessary, notices should be exhibited in places where baits are laid to warn people to keep dogs or other animals away from the place. When poisoned baits are laid by a Rat Club or other organization, it would be as well to

insist that each group of baits should be numbered, and its situation, success, or failure and ultimate destruction recorded in a book.

Rat viruses, on the other hand, of which there are several on the market, can be used without fear of direct injury to any animals other than rodents. These viruses are believed to be composed in every case of a culture of a microbe causing a specific disease of rats, which in some cases, at any rate, is contagious, so that the inoculated rat conveys the disease to his fellows. The uncertainty with which this method is attended is due partly to the difficulty of securing a successful infection in all cases, and partly to the fact that, if only slightly infected, rats recover and therefore become more or less immune to the disease.

It cannot be too strongly urged, therefore, that if there is to be a successful attack upon rats in any district, reliance should not be placed in any one of the methods referred to above, but that as far as possible under the circumstances *all these methods should be employed.* Rats are intelligent animals and will soon learn to evade any one of these devices, and will even vacate for a time the district in which they are being harried. If, therefore, it is proposed to exterminate the rats in a large district, means should be employed whereby this intelligence can be used to compass their destruction. With this object combined efforts should be made over a wide area, and the attack made in a circle radiating from a given spot in which it is considered that the final work of destruction can be accomplished with less difficulty. Rat hunts should be organized simultaneously on the circumference of this circle, traps and poison should be laid on the outside and food supplied on the centre to which the rats should be driven. Every precaution should be taken to see that no rats escape outwards, and their holes should be closed, and their runs and nests destroyed as the circle is gradually drawn closer. Finally, when a broad band at the circumference has been cleared, poisoned food should be employed in the centre, and virus laid where the rats can take the disease.—Board of Agriculture and Fisheries. (*Leaflet* 224.)

Miscellaneous.

UNIVERSITY OF LONDON.

B.Sc. Examination in Veterinary Science for Internal and External Students.

Pass List, 1910.

1802. Graves, Thomas Chivers, Royal Veterinary College.
1801. Sheather, Alfred Leslie, Royal Veterinary College.
1851. Thompson, Leonard, Royal Veterinary College.

Examiners: Veterinary Hygiene: S. Stockman, M.R.C.V.S., and G. H. Wooldridge, F.R.C.V.S. Veterinary Pathology: W. Bulloch, M.D., C.M., and Professor Sir John McFadyean, LL.D., C.M., M.B., B.Sc.

FACULTY OF SCIENCE (VETERINARY SCIENCE). GENERAL INTERMEDIATE EXAMINATION (PART II.) FOR INTERNAL STUDENTS.

PASS LIST, 1910.

1901. Edwards, James Thomas, Royal Veterinary College.

Examiners: Veterinary Physiology: Drs. W. D. Halliburton, and G. A. Buckmaster.

ROYAL COLLEGE OF VETERINARY SURGEONS.

FELLOWSHIP DEGREE.

A MEETING of the Board of Examiners for this Degree was held on December 3, 1910, at 10, Red Lion Square. Five candidates entered for the Examination, and all were successful. The following is a list of the new Fellows, together with the titles of their respective theses:—

Professor A. Gofton, "Fractures of the Hip-bone."
Captain E. Clive Webb, "Rabies and its Control in India."
Mr. A. B. Mattinson, "The Eradication of Bovine Tuberculosis."
Mr. E. M. Jarvis, "A Pyo-lymphangitis in Equines in Southern Rhodesia."
Mr. John Brown, "The Control of Tuberculosis by the Artificial Immunization of Calves.

The Examiners were Professor J. Macqueen and Messrs. J. Malcolm and W. Hunting, Mr. S. Villar being in the chair. The President of the College (Mr. W. Freeman Barrett) was also present.

FRED BULLOCK, *Secretary.*

EXAMINATIONS IN LONDON.

At a meeting of the Board of Examiners held in London on December 9 for the Written, and on and between December 16 and 22 inclusive for the Oral and Practical Examinations—

The following gentlemen passed their Final Examination:—

Mr. R. M. Aulton	Mr. R. Moore
,, B. R. Body	,, J. de Meza
,, D'Arcy S. Beck	,, U. F. Richardson
,, J. McK. Brown	,, G. A. Roberts
,, L. F. Eady	,, W. K. Stephens
,, T. J. Faithfull Davies	,, H. D. Sparrow
,, J. C. Gaunt	,, T. L. Vaisey
,, B. G. M. Hickey	

The following gentlemen passed their Third Examination:—

Mr. F. G. Buxton	Mr. E. J. Lainé
,, J. Bradley	,, A. V. Nicholas
,, W. H. Kirk	,, C. W. Perrin
,, R. B. Leach	,, B. M. R. West

The following passed their Second Examination:—

Mr. A. L. M. Bebb	Mr. W. E. Petty
,, S. E. Hill	,, E. M. Robinson
,, C. J. R. Lawrence	,, S. L. Slocock
,, R. A. Murless	,, P. L. Thierry
,, A. A. Pryer	

The following passed their First Examination :—

Mr. A. H. Adams*
,, J. A. Edwards
Mr. B. J. W. Nicholas*
,, L. D. D. Sewell

Marked thus * passed with Second Class Honours.

Examinations in Dublin.

At a meeting of the Board of Examiners held in Dublin on December 9 for the Written, and on December 13 and 14 for the Oral and Practical Examinations, the following gentlemen passed their Final Examination :—

Mr. J. M. White
,, S. Hunter
,, C. H. Bryans
,, P. A. Carroll
Mr. G. A. Kelly
,, J. S. MacCann
,, F. J. Weir
,, E. Wilson

The following passed their Third Examination :—

Mr. R. Devereux
,, W. Flanagan
,, J. J. G. Keppel
,, P. O'Connell
,, R. P. Byrns
,, J. Evans
,, V. Fox
,, L. J. Kelly
Mr. L. C. Maguire*
,, R. Marner
,, W. J. O'Donoghue
,, A. E. O'Neill*
,, W. E. Phipps
,, W. H. Power
,, C. J. Ryan

The following passed their Second Examination :—

Mr. V. Kennealy
,, T. F. Quirke
,, P. J. Sheil
,, E. H. Wyly
Mr. E. J. Clancy
,, C. E. Huston*
,, T. J. Carroll

The following passed their First Examination :—

Mr. J. Campbell
,, W. G. Clarke
,, T. F. Donworth
,, J. J. English*
Mr. H. J. Lowe
,, S. O'Donel
,, M. H. Reid

Marked thus * passed with Second Class Honours.

Examinations in Edinburgh.

At a meeting of the Board of Examiners held on December 9 for the Written, and on and between December 14 and 17 inclusive for the Oral and Practical Examinations—

The following gentlemen passed their Final Examination :—

Mr. William Aitken
,, H. Allison
,, J. L. Cormack
,, H. Fraser
Mr. W. S. Lornie
,, H. C. Lowry
,, J. P. Swan
,, C. G. Thompson

The following passed their Third Examination :—

Mr. A. W. Carter	Mr. T. A. McClintock
,, W. Dalling	,, G. Currey

The following passed their Second Examination :—

Mr. L. Anderson	Mr. H. E. Jackson
,, R. E. Drennan*	,, S. E. Holmes
,, D. R. Williamson*	

Marked thus * passed with Second Class Honours.

Examinations in Glasgow.

At a meeting of the Board of Examiners held in Glasgow on December 9 for the Written, and on December 14 and 15 for the Oral and Practical Examinations—

The following gentlemen passed their Final Examination :—

Mr. W. Anderson	Mr. W. M. Jackson
,, W. S. Inglis	,, D. A. Taylor
,, J. Dunlop	

The following passed their Third Examination : —

Mr. J. Scott*	Mr. W. Macfarlane*

The following passed their Second Examination :—

Mr. D. Pollock	Mr. J. McI. Galloway
,, D. G. MacLeod	,, P. J. Turner

Marked thus * passed with Second Class Honours.

Examinations in Liverpool.

At a meeting of the Board of Examiners held in Liverpool on December 9 for the Written, and on December 15 and 19 for the Oral and Practical Fxaminations—

The following gentlemen passed their Final Examination :—

Mr. S. G. Millington	Mr. W. Taylor

The following passed their Third Examination :—

Mr. H. D. Lewis	Mr. A. D. Bunton

The following passed their Second Examination :—

Mr. A. D. Morgan	Mr. H. A. Thorne

The following passed their First Examination :—

Mr. J. W. Beaumont	Mr. M. W. Holland

Translations.

SOME RARE CASES OF RECOVERY IN PRACTICE.

By AD. HOFMANN.

Veterinary Surgeon, Radstadt.

CASE I.—In June, 1909, I was called to a heifer, 1½ years old, which was affected eight days after calving with puerperal septicæmia, and had a temperature of 41° C.; appetite had gone, and milk flow ceased. The cervical canal was closed so that only radical treatment difficult and prolonged would give any hope of recovery. Ten litres of lukewarm ½ per cent. lysol solution was infused into the uterus, and the injected fluid was partly emptied after one or two fingers had been inserted into the mouth of the womb and the cervical canal, causing uterine contractions; 2 to 3 litres ½ per cent. alum solution followed. Treatment was rather difficult, for it was necessary that the disinfectant should pass well into the uterus. This was accomplished by means of an indiarubber probang pushed into the uterus through the cervical canal as recommended by Professor Rusterholz, and the fluid infused through it. Such an operation was continued for three-quarters of an hour. Such treatment may also be carried out by a fine bone or metal tube 6 to 8 cm. long, and a similar instrument attached as used by Evers in inflation of the udder. Such a tube is especially necessary where the cervical canal is nearly closed, and does not give way to finger or indiarubber tube pressure.

Treatment was continued fourteen days, and much chocolate-coloured discharge voided. On the 15th and following days a certain quantity of dead *débris* was still in the vagina and the fever remained present. Internally, ½ litre of spirit of frumenti and ½ litre of strong black coffee mixed were given three times daily, and the last eight days decoction of savin as well. Alcohol was also given, which I have found exceptionally useful where septic fever is present. Salicylic acid, antifebrin, antipyrin, and digitalis, &c., are too costly in cattle practice if used for a long time, and I have obtained equally good results with alcohol and black coffee.

As a cure was not effected in fourteen days, 5 to 8 litres of a 1 per cent. alum solution with 30 gm. of creolin was injected for three weeks, and after about twenty injections a cure began. For some days after this, the owner treated the heifer himself, and six months later the cow was pregnant. The long course of this treatment was due to the heifer being jumped at 9 months old by a bull that had got loose by breaking his chain. The fœtal coverings were consequently very firmly fastened to the cotyledons. The feed was composed of wheat bran gruel with salt, beet, green food, and meadow hay.

CASE II.—The second case was in a cow which showed weakness of the hindquarters, high fever, loss of appetite, and had both hock joints swollen and painful. Examination showed retained afterbirth and secondary infection.

Treatment: First day, disinfection of the uterus with 1 per cent. bacillol solution, and infusion of ½ litre of 1 per cent. potassium iodide solution, into two teats, and ½ litre of 1 per cent. watery solution of

ferrum pyrophosphoricum with natrio citrico into the two other teats, with a view of forming iodide of iron in the blood. Internally, 50 gr. of salicylate of soda was given in savin decoction, and the loins and belly wrapped in hot flannel. On the second day of treatment there was an improvement, which I partly ascribed to the iodide of iron, which in human medicine is especially recommended for nourishing the central nervous system and has produced excellent recorded results.

After the second day ½ litre of spirit of frumenti and ½ litre of strong black coffee (without chicory) were given. On manual examination a handful of yellowish sodden remains of the afterbirth were removed. For several days disinfection of the uterus was undertaken twice daily, and on the fourteenth day the owner announced a complete recovery.

CASE III.—A horse with hæmoglobinuria, in the winter, was dragged out of the field into the stable on a sledge. It was a severe case and I gave a guarded prognosis. The animal lay prostrate in the stall, and by his violent movements with the hind legs was dangerous to himself and surroundings. Further examination showed an imperceptible pulse and weak heart-beat. Rectal examination showed that the bladder was distended with urine. Therapy: emptying of the black-coloured urine from the bladder by means of the catheter and intensive massage of the organ. By catheterization alone it was not possible to empty the bladder, but by intensive massage of the anterior portion against the neck of the bladder the complete emptying of the urine was accomplished. A salt-water clyster to aid the alkalinity of the blood was given, and a dose of aloes with soda bicarbonate. To combat the heart weakness 15 g. of digalen was injected subcutaneously. Ten minutes after this injection the prostrate horse sprang up suddenly in the stall to the great astonishment of the bystanders. I will here remark that the digalen produced a wonderful and momentarily effect, and few other drugs could have produced a result so quickly. The effect of digalen on the heart is marked and noticeable, as District Veterinary Surgeon Dorn has already proved in certain cases.

CASE IV.—A horse with strangles and dangerous complications; metastasis in both lobes of the lungs. The four weeks' treatment consisted of operative opening of large glandular abscesses in the head, and antiseptic treatment of the wounds with creolin, lysol, and bacillol solutions, without making progress, on which account during the last week the wounds were injected with 1 per cent. bacillol solution in about 1 litre of carbolic spirit (20 : 1,000), and the wound closed in a short time. The metastasis in the lungs took a favourable course, connective tissue capsules forming around the small abscesses, so that this case of recovery may be reckoned a rare one. Green food in the summer containing calcium and soda salts did its share in the healing process. For the treatment of the patient I chose potassium, calcium, sodium, and phosphoric acid, containing food in proportions arranged from thetable of G. Rupp—"Examination of Nourishing and useful means in Human Medicine," Heidelberg, 1900—and calculated proportionately for veterinary use.

(*Deutsche Tierärzt. Wochenschrift.*)

CHRONIC CYSTITIS AND RUPTURE OF THE BLADDER IN A MARE.

By SIVIERI.

A WELL-BRED mare, Frioul, aged 15, fell ill and ceased to urinate. She became semi-comatose, posterior limbs straddled, frequent attempts at micturition only giving vent to some drops of reddish filamentous liquid which trickled down the thigh. Temperature, 36·8° C.; respiration superficial, extremities cold. The mare had been led three times to the stallion six months previously, but signs of œstrum had reappeared since, and had apparently become very frequent in the days preceding the illness.

It was concluded, however, that a chronic cystitis had happened unperceived and had been mistaken for œstrum—vaginal exploration revealed in place of the bladder a fibrous oval body hardly the size of a turkey's egg.

On introducing a flexible caout-chouc sound into the bladder, only a few drops of urine were passed and on pushing the catheter slowly on no resistance was encountered. It was certain the bladder was ruptured. The mare died in the evening. The bladder was greatly retracted, and the walls thickened; the cavity was reduced to a cylindrical space of 2½ cm. in diameter; in its depth a little to the left the wall was ruptured to a length of 6 cm. The edges of the rent were slightly necrosed. Lesions of peritonitis explained the death.

(*Revue Générale de Médecine Vétérinaire.*)

Letters and Communications, &c.

Captain H. Jolliffe; Captain E. C. Webb; Mr. Chambers; Mr. E. W. Hoare; Miss Jones; Captain Mellard; Mr. L. E. W. Bevan; Mr. Dalrymple; Mr. Palgrave; Mr. F. Bullock; Captain Leese; Board of Agriculture and Fisheries; Department of Agriculture and Technical Education for Ireland.

Books and Periodicals, &c., Received.

Proceedings of the Royal Society of Medicine; Encyclopædia of Sport, Parts XII. and XIII. (Mr. W. Heinemann); Journal of the Royal Army Medical Corps; Agricultural Journal of the Cape of Good Hope; Agricultural Journal of the Transvaal; American Journal of Veterinary Medicine; Bulletin of the Bureau of Sleeping Sickness; Rhodesian Agricultural Journal; Bureau of Annual Industry, U.S.A.

NOTE.—All communications should be addressed to 8, Henrietta Street, Covent Garden, London, W.C. Telephone, 4646 Gerrard. Telegrams, "Baillière, London."

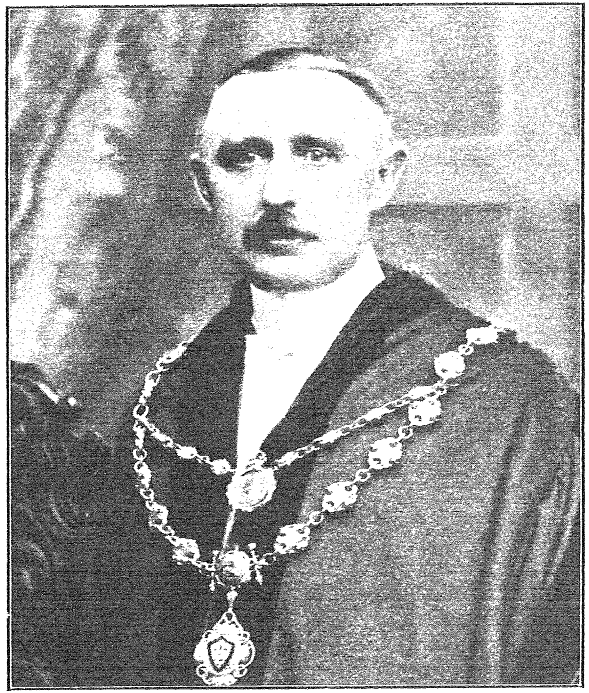
Letters for the JOURNAL, literary contributions, reports, notices, books for review, exchanges, new instruments or materials, and all matter for publication (except advertisements) should be addressed to the Editors.

Manuscript—preferably type-written—should be on one side only of paper, marked with full name of author.

Illustrations for reproduction should be in good black or dark brown on white paper or card.

Advertisements and all business matters relating to the JOURNAL should be addressed to the publishers, Messrs. Baillière, Tindall and Cox.

MR. R. C. TRIGGER, J.P., F.R.C.V.S.
Mayor of Newcastle-under-Lyme.



MR. R. E. L. PENHALE, J.P., M.R.C.V.S.
Mayor of Torrington.

(*For Biographical Note see* VETERINARY JOURNAL, *January*, 1911.)

THE

VETERINARY JOURNAL

FEBRUARY, 1911.

Editorials.

INTERTRANSMISSIBLE HUMAN AND ANIMAL TRYPANOSOMES.

A Correction and an Explanation.

In this issue of the Veterinary Journal is to be found an article from the *Proceedings of the Royal Society*, by Colonel Bruce and others, pointing out that cattle in infected zones may act as a reservoir of the virus of sleeping sickness. We made reference to this in an editorial note in our issue for January, and followed it with some comments on a communication which we had received for publication from Mr. Bevan. This article appeared on pp. 41-47 of that number, and concerned a human trypanosome obtained from an European who had apparently contracted the disease in Northern Rhodesia. Bevan had successfully inoculated this trypanosome into the following species —viz., rabbit, guinea-pig, rat, mule, and sheep—but at the time of forwarding us the note he had not been able to definitely identify it. In this connection Bevan said, "It has been suggested that the human trypanosome of Northern Rhodesia may not be *Trypanosoma gambiense*, but some animal trypanosome habituated by the method of transmission or passage to the human host."

A few days before receiving Mr. Bevan's article by post, we received through the courtesy of the Director of the Sleeping Sickness Bureau a copy of the following cablegram, sent through the British South Africa Company: "Communicate the following to Sleeping Sickness Bureau from Bevan. Referring to report posted December 3, cattle trypanosome from North Eastern Rhodesia now recognised as *T. vivax*. Please correct and inform Wooldridge. Veternosis." On receiving the article we published last month, we naturally supposed the cablegram to refer to it, and we accordingly

inserted a footnote embodying the purport of the cablegram. This was an unfortunate error, and we are grateful to the Director of the Sleeping Sickness Bureau for drawing our attention to it, and pointing out that the cablegram had reference to an article published by the *Veterinary News* of January 7, entitled, "Note on a Trypanosome found in Cattle from North Eastern Rhodesia." Evidently the copy of the cablegram should have gone to the Editor of the *Veterinary News*, and not to us.

Commenting on the matter last month, we said: "This trypanosome (*T. vivax*) is known as causing disease in cattle, sheep, and goats in the Cameroons, but we are unaware of it having been previously found affecting human beings." Our hesitancy was completely justified, and we hasten to correct the unfortunate error.

In a footnote to a summary of Mr. Bevan's paper in the *Bulletin of the Sleeping Sickness Bureau*, the Editor points out that the human trypanosome referred to is that described by Stephens and Fantham as *T. rhodesiense*, and is quite distinct from *T. vivax*.

W.

A CLEAN MILK SUPPLY.

We have received three leaflets prepared by the Joint Committee on Milk of the National Health Society and the National League for Physical Education and Improvement, dealing with the above subject. They consist of instructions to three different classes of people associated with milk, viz., the producers, the distributors, and the consumers respectively, and their object is to assist in obtaining a clean and wholesome milk supply, or at least to reducing the various chances of contamination and ill-effects as far as possible under present conditions. If the persons addressed in the respective leaflets will follow the advice offered, they will do so with practically no expense to themselves, and will do much to achieve the very desirable objects for which the above-named societies have been brought into existence. We reproduce on pp. 116-118 in full a copy of Leaflet A, which is perhaps of the highest importance. As will be seen, it is written in clear and lucid language, free from technicalities, and in such a way as to be easily understood by anybody who can read. The other leaflets are equally clear and concise, and may be purchased very cheaply. Any person interested in the subject would do well to buy some and distribute them for the education of those who are not well informed in these matters.

General Articles.

REMARKS ON MILK FEVER FROM A CLINICAL ASPECT.

By E. WALLIS HOARE, F.R.C.V.S.
Cork.

It is only those having experience of country practice who can really appreciate the great boon conferred on the owners of cattle by the introduction of the Schmidt treatment of milk fever. Previous to this the mortality from this disease was so high that every form of treatment was in turn tried, but found to fail.

Probably had the practitioner, who discovered the successful treatment, devoted his attentions instead to speculations as to the exact cause of the disease, or discovered a bacillus without finding a measure to combat its effects, he would long ere now be accorded a high place in the scientific world, and be the recipient of many honours.

However this may be, and no matter how many theories may be advanced to explain the etiology of the disease, we have at last a reliable form of treatment, although we cannot explain the *modus operandi* of the therapeutical measure adopted. Empirical, no doubt, the treatment is, but, nevertheless, it proves eminently successful. But like all other diseases, a variable number of fatal cases occur in spite of treatment. Some practitioners, indeed, claim that under the present system of treatment they never lose a case.

This may be attributed to the fact that treatment is resorted to on the appearance of the primary symptoms of the disease; or the practitioners may belong to that fortunate class of lucky individuals who "never lose a colt after castration," and they have similar results with milk fever. As, however, I do not happen to belong to that class, I find that a certain number of cases of milk fever die in spite of treatment. The cause of death in many of these cases is difficult to discover, but in some at least it is possible to suggest an etiological factor.

From a clinical aspect these cases may be referred to certain groups, and in passing I may remark that it is not the patients who show the most severe cerebral symptoms at first that supply the largest number of fatal cases.

There is no doubt but that the earlier professional attendance is availed of, the fewer will be the number of fatalities; hence the in-

telligence of the owners is an important factor in the question of results.

Group A.—Those in which the owner has administered the ubiquitous dose of Epsom salts before the practitioner arrives.

Fortunately these cases are becoming less frequent in the present day, as the owners are commencing to appreciate the fact that drenching in any shape or form is not only useless, but dangerous, and frequently produces fatal results in this disease.

In consequence, however, of the inherent love for drugs possessed by mankind, it is often difficult to persuade some owners of animals that any drugs administered by the mouth cannot produce any beneficial effects in milk fever, and are far more likely to do harm. I have always observed that the effect of Epsom salts in this disease was to add to the depression already existing, while in a large number of instances inhalation broncho-pneumonia was produced, which only showed marked symptoms after the animal had regained consciousness.

Group B.—Cases in which consciousness returns after treatment, but there is complete loss of power in the hind limbs.

These furnish a large proportion of the fatal cases, as in spite of every form of treatment the paralysis remains, and the animals are unable to rise.

In some instances the hypodermic injection of full doses of strychnine, and the application of strong counter-irritants to the spine may produce desired results, but in my experience recovery is the exception. What the lesion is in the spinal cord that is responsible for the paralysis I have not the slightest idea.

No one now doubts that milk fever may appear *prior* to parturition, and in my experience such cases often terminate in persistent paralysis.

Some authors describe a form of paralysis occurring just prior to parturition, and another—*post-partum* paralysis—appearing after parturition, but I fail to see how these are to be differentiated from cases of milk fever.

Group C.—Cases that die in rather a sudden manner, without any appreciable cause.

These are not common, and the sudden occurrence of death would suggest syncope. The animals regain consciousness in the ordinary manner, get on their feet, commence to feed and ruminate, and, after a variable period, die suddenly; in some instances hæmorrhage from the nostrils has been observed.

Group D.—Cases in which relapses occur. The animal apparently recovers in the ordinary manner, but next day is found down again, and all the symptoms return. On again distending the udder with air, she may regain consciousness, get on her feet, and in a variable period go down a third time, never to rise again, as a rule. These cases are very annoying and difficult to account for. In my experience it is not the cows in specially high condition that furnish most of these relapsing cases, indeed many of them are in poor condition.

I have observed that if the udder be in a flabby condition, containing little milk, and not inflating easily when air is pumped in, the case is likely to do badly. Of course, this may only be a coincidence, but I have observed it on several occasions. Cows subjected to chills, exposure on long railway journeys after calving, especially in cold wet weather, are likely to prove bad subjects for the disease.

Cows recently calved, and purchased by dealers at country fairs, are well known to be liable to milk fever, whether in high condition or otherwise.

In this district, during the present month (November), the disease has been very common, and certainly cows at this season are not in high condition, while the weather has also been very cold and wet. I have come to the conclusion that the influence of high condition and hot weather in the production of the disease has been greatly exaggerated. No doubt the *sudden* appearance of hot weather does bring an increase in the number of cases, but what about the large proportion that occur during the winter months?

Can we adopt any precautions to prevent the occurrence of fatal cases? I think there are some little details which seem to turn the scale in favour of the patient.

(1) With reference to milking. No milk should be removed from the udder until the following day, after the "pneumatic" treatment has been carried out. Even then the udder should not be milked dry. I have often observed that it is after complete milking has been carried out that the animal goes down again.

(2) With regard to food, the animal should be kept on spare diet for a few days. A rumen filled up with food seems likely to bring about a relapse, as some cows commence to feed ravenously after regaining consciousness and getting on their feet.

(3) The cow should not be left out on grass too soon, especially when the weather is hot. Hot, ill-ventilated buildings have also a tendency to induce a relapse.

In a word, moderation in milking, in food and in exercise are to be observed.

Clinical observation of a large number of cases of milk fever under various conditions, shows one that different types of the disease are met with. Many intelligent owners now call in professional assistance when the primary symptoms of the disease present themselves.

These symptoms are generally paddling with the hind feet and a staggering gait, sometimes associated with a dazed appearance of the eyes and countenance. These symptoms often come on shortly after milking has been carried out.

The practitioner proceeds to adopt the "pneumatic" treatment, while the cow is standing, but it often occurs that during the process she staggers and goes down. Such cases generally do well.

Mild cases are sometimes met with, so mild, that by the time the practitioner arrives the animal is rapidly improving. Still, the "pneumatic treatment" has to be adopted as a matter of precaution, as well as on the plea that "something must be done."

Cases characterized by marked delirium are common, some of these necessitate the application of restraint to the limbs before the pneumatic treatment can be applied.

The "calmative" effect of the injection of air in such cases is simply wonderful to behold, far exceeding that of chloral hydrate. Cases are met with in which deep coma sets in early, but even here the "pneumatic" treatment exerts remarkable effects. One peculiarity I have observed with reference to milk fever, is that a series of successful cases is the rule in some seasons, while in others, one encounters a run of deaths, fortunately the latter are usually few in number, but still they prove discouraging, and to unreasonable owners they suggest some lack of skill on the part of the practitioner.

With reference to cases that are said to occur some months after parturition a certain amount of doubt may exist, but the effect of the "pneumatic" treatment would lead one to believe that the affection was at any rate similar, if not identical, with milk fever.

It is not unreasonable to suggest that if a case showing certain nervous symptoms recovers rapidly after injecting air into the udder, the affection is milk fever, or a type of that disease. Even shortly after parturition symptoms may appear which are not diagnostic of milk fever, and an element of doubt may exist as to the diagnosis.

There is a tendency to attribute any symptoms shown shortly after parturition to milk fever, and no doubt at times cases of the disease are said to recover, when in reality the symptoms were due to other causes. And I must admit that I have had considerable difficulty at times in coming to a conclusion in certain cases showing

obscure symptoms, such as loss of appetite, accelerated respirations, dulness, inaptitude for exertion, occurring shortly after parturition, as to whether these symptoms were to be attributed to the commencement of milk fever or to some other affection.

Probably when in doubt it is advisable to treat the udder, as otherwise on our departure symptoms of milk fever may develop.

One great advantage of the "pneumatic" treatment which distinguishes it from many others is that it cannot do the patient any harm, even if the disease does not happen to be one of milk fever. This cannot be said for many therapeutical measures.

As regards the treatment of the disease there is little to be said.

The well-known success of the treatment by filling the udder with air, has placed this method above all others.

Simple in administration, perfectly safe, as it can be repeatedly carried out without any risk of mammitis occurring, and, above all, successful.

As regards attempts to sterilize the air, this is entirely unnecessary, although it may look well and assist in "playing to the gallery."

I have treated cases in the most filthy cow-houses imaginable, pigs also inhabiting the building, and the air of a nauseating character, but I omitted attempts at sterilization of the air, and the results were satisfactory.

I shall not attempt an academical discussion on the question as to the therapeutical action of the air, but I have always observed that the more firmly the udder is distended the better the results.

There may be a grain of truth in the mechanical theory of its action. But as we do not know anything definitely with reference to the pathology of the disease, it is difficult to explain how the pneumatic treatment really acts.

One term, however, should be rigidly excluded from the nomenclature of the disease, and that is "apoplexy," as, if the semi-comatose condition depended on this lesion, one fails to see how inflating the udder could cause a disappearance of the symptoms and recovery in a short space of time.

With reference to prevention, many measures have been suggested. It is often said that if the calf be left with the cow for some days the disease will not occur.

Having seen a number of cases occur when this measure was adopted, I doubt its efficacy. I find the most important means of prevention is with reference to the milking. If the cow prior to calving shows a considerable amount of milk, milking should be

carried out. After calving, the cow should not be milked dry for the first few days; the milking should be carried out at intervals.

Probably this is why leaving the calf with the cow may exert a preventive influence, as the milk is gradually withdrawn.

Some time ago the above preventive measure was described as emanating from a Continental practitioner, but in reality it has been known in Ireland for many years, and advised by practitioners.

No doubt it is also of importance to limit the animal's diet for some time prior to parturition, in the case of cows in high condition.

The practice of giving preventive drenches for the disease, however useful from a commercial point of view, cannot be described as rational therapeutics.

For inflation of the udder with air, a very useful air-pump is supplied by Hauptner, Berlin. It is a form of foot-pump, and the required degree of distension of the udder is accomplished with no fatigue to the practitioner, and very quickly. By means of a proper length of tubing, the operator is well out of the way of the animal's hind legs, which is a matter of importance in the case of cows during the exciting stage of the disease. The instrument is portable and simple, and it permits of a higher degree of udder distension than any other I have tried.

A few drops of ol. eucalyptus, or of ol. fœniculi, placed on the wool in the filter portion, exhales a pleasing odour during the working of the instrument, and gives the onlookers the idea that something possessed of miraculous powers issues from the instrument.

For some degree of mystery must enter into the treatment of even a disease like milk fever, as a sort of set-off to the efforts of philanthropic (?) professors (*sic*) who, by writing newspaper articles and lecturing on the subject, endeavour to perpetuate the pernicious system of "everyone his own cattle doctor."

GANGRENOUS FOOT-DISEASES OF CATTLE (BACTERIAL NECROSIS).

By H. A. REID, F.R.C.V.S., D.V.H.

Officer in charge of the Veterinary Laboratory, Wellington, N.Z.

GANGRENE of the feet, principally affecting cattle, has been frequently reported from various parts of New Zealand. The disease appears to be endemic in certain localities. Reports on the appearance of cases of this nature have been almost exclu-

sively confined to the North Island, a fact which will be considered in relation to the cause of the condition.

In certain districts such outbreaks in the past have nearly always been referred to the effects of ergot. It is possible that in certain instances ergot may share indirectly in the production of the gangrenous lesions, but I consider that it yet remains to be proved whether the ingestion of ergotized food has any special significance as a potential factor in the etiology of the disease.

Shortly after rejoining the Department in 1908 I had an opportunity of investigating an outbreak of gangrene affecting cattle. The trouble had been almost unanimously declared by farmers in the locality to be due to ergot poisoning. The result of my investigations then led me to doubt whether ergot could be held responsible, and later observations have convinced me that true ergotism must be a rarer condition than is generally supposed, since I have never yet observed the classical symptoms attributed to this form of poisoning. My conclusions regarding the nature of the outbreak referred to were embodied in a report to the Chief Veterinarian, from which the following remarks are extracted:—

"None of the cattle on adjacent farms appear to have been attacked, and the owner himself, an intelligent farmer, does not ascribe the trouble to the effects of ergot. Moreover, none of the symptoms generally recorded of poisoning by this agent are present—such, for example, as gastro-enteritis, congestion and hæmorrhages of the visible mucous membranes, emaciation, abortion, and the usual history of occurrence during cold weather. . . . In the absence of more definite information, I do not feel satisfied that the symptoms are the result of ergotism, and have therefore to conclude that they are due to some topical irritant of undetermined origin."

The symptoms which generally characterize the affection are as follows: As a rule, heifers or milking-cows are attacked towards the fall of the year or during winter. A keen observer will notice that certain of the animals appear restless, and disinclined to support weight on one particular leg, generally a hind leg. In the bails cows may be seen to stamp or paw the ground with the affected foot. Later on, lameness becomes apparent, gradually becoming acute, and accompanied by painful swelling of the pastern and fetlock. Constitutional symptoms, in the

shape of loss of appetite and condition, fever, constipation, and diminution of the milk-secretion accompany the appearance of the local lesion. In about two or three days the swelling breaks above the coronet, discharging purulent contents. Gangrene of the affected portion of the limb then sets in; the lesion extends, and involves the tissues below the cannon bone. The claws, or even the whole of the foot, may slough off from the joint, leaving the denuded bone exposed. Above the gangrenous area the limb remains in a normal condition, a sharp line of demarcation, composed of congested and œdematous tissue, existing between the gangrenous and healthy portions. There is complete loss of sensation below this area, but the blood-vessels may still be active, the gangrenous part bleeding on manipulation. It is most common to find only one leg affected. As a general rule, when taken in time and properly treated, the disease runs a benign course. Resolution takes place in about twelve to fourteen days. In consequence of the diminished milk-supply and loss of condition of the affected subjects, owners frequently suffer serious monetary loss, while the dressings and attention which must be given in order to promote recovery occupy a considerable amount of time which might otherwise be more profitably employed.

An Allied Condition Affecting Pigs.

A number of cases presenting similar though differently situated lesions have come under observation affecting pigs. In these animals the snout and skin covering the head and sides of the shoulder are generally the sites of the necrotic lesions. These take the form of a spreading ulceration, giving rise to great irritation and loss of condition. Occasionally the skin and integument around the eyes are involved. The resulting inflammation affects the conjunctiva, inducing a purulent discharge from the eyes, which may lead to temporary or permanent loss of sight. In very severe cases the ulcerated surface may extend over an area from two to three inches up to the size of a dinner-plate in dimension, giving rise to deep excavations, surrounded by a hard, fibrous-looking growth. Under suitable treatment recovery can usually be effected, although in young animals serious mortality may follow with embolic, necrotic lesions in the liver and kidneys.

The essential cause of these conditions in both cattle and swine has been determined to be due to a micro-organism known technically as the *B. necrophorus* (Flugge). This organism—first isolated by Löffler in 1884 from cases of so-called "calf-diphtheria"—has since been observed and studied by various authorities, notably Bang, McFadyean, Schmorl, Mohler, and Morse. Bang, on account of the characteristic lesions following infection, termed it the "necrosis bacillus." The appearance generally assumed by the bacillus is in the form of long, slender filaments, measuring 80 to 100 microns in length, and from 0·75 to 1·5 microns thick. Shorter bacillary forms are also frequently observed, the shortest, in fact, resembling cocci. The organism is thus polymorphic. It is a strict anaerobe, only developing in the absence of air or oxygen. The necrosis organism has evidently a wide distribution in nature, leading a saprophytic existence in manure and in the soil of certain localities. Bang has demonstrated its presence in the intestines of healthy pigs, and according to Nocard and Leclainche it may be regarded as an occasional or habitual habitat of the alimentary canal of all herbivorous animals. Among the smaller animals, rabbits and mice are particularly susceptible to infection. They have been repeatedly employed to recover the organism after inoculation with material derived from a naturally-infected source. Guinea-pigs are, in our experience, under ordinary conditions, immune. The necrosis bacillus is innocuous to man, unless, according to Schmorl, it is associated with the presence of pyogenic organisms, which then render infected wounds very difficult to heal. Doubtless the same remarks would apply in the case of the lower animals. We have found it constantly associated with cocci, apparently the *Staphylococcus citreus*. The *B. necrophorus* gains access to the tissues through the skin, and the factors favouring infection may be classified as mechanical, chemical, and vital. As an instance of the first group, any injury sustained resulting in a wound or abrasion may be taken. Under chemical agents may be placed influences, such as cold, continued exposure to wet or damp, or malnutrition of the skin through digestive disorders, leading to an eczematous eruption and irritation. Vital agents comprise the various bacteria present in the skin, which, under certain conditions, are capable of setting up inflammatory changes deleterious to the histological elements. One or more of these factors may be held responsible for the

entrance of the necrosis organism, which can only exert its peculiar effects when the skin-surface has been injured or has otherwise undergone some abnormal change. The ingestion of ergot may be cited as a possible factor included under chemical agents. It is probable that ergot may induce some constriction of the arterioles, resulting in defective vascular nutrition of the skin. It appears to be well established that necrosis of the feet more frequently occurs in cattle known to have been grazing on ergotized pastures. It is also a fact that the condition occurs on pastures wherein no evidence of the operation of this factor can be traced.

In my experience typical symptoms of ergotism have never been observed; hence in the majority of cases investigated it would not have been possible to conclude that ergot alone was responsible for setting up this condition. I would recommend that experiments be carried out to decide how far the toxic properties of ergot may influence the production of the gangrenous changes.

Introduction of the *B. necrophorus* into the tissues of susceptible animals leads to a necrotic caseous degeneration of the surrounding parts. The centre of such caseous débris is, as a rule, devoid of bacilli. The organism should be sought at the margin of the degenerated and healthy tissue some depth from the surface. Stained preparations, examined microscopically, reveal the bacilli arranged in a filamentous mass, easily mistaken on casual observation for fibrin or loose shreds of areolar connective tissue. The *B. necrophorus* is easily stained by the aniline dyes: Löffler's alkaline methyline blue, or Ziehl's carbol-fuchsin give excellent results. It does not stain by the method of Gram. The study of its physiological effects indicates that the necrosis organism elaborates an active soluble toxin which proves fatal to rabbits in from five to ten days. Generally, prior to death the animal is thrown into tetanic convulsions produced by the action of the absorbed toxin upon the central nervous system.

A significant point in relation to the study of bacterial necrosis is the fact that, so far as observation goes, it appears almost wholly confined to the North Island. No doubt the habits of the *B. necrophorus* are well adapted to the comparatively mild and humid climate of the North Island, permitting it to remain for a longer period in an active condition in the soil or excreta.

From a knowledge acquired by a study of the occurence of the bacillus in nature, one would expect that cattle on old, soiled pastures, or those occupying dirty yards contaminated by an accumulation of fæcal deposits, would be more prone to become affected. This, however, does not prove to be invariably the case. Cattle on freshly-cleared land are sometimes found to be affected. It is noticeable that certain paddocks appear more liable to convey infection than others. These may probably afford in some way a more suitable environment for the propagation of the bacillus.

Treatment.—The treatment of this gangrenous condition calls for the energetic application of remedies which will relieve the pain caused by the inflammatory changes, and, further, destroy the action of the pathogenic organism. In cattle, whenever the first symptoms of tenderness and swelling of the coronet are observed, the part should be thoroughly cleansed with hot water containing a little soda. If practicable, a hot bran poultice, which has been prepared with the addition of a little disinfectant—such as non-poisonous sheep-dip—may be applied, and maintained in position, to promote the softening of the tissues and ultimate suppuration. The poultice must not be allowed to become cold, and should be changed at intervals during the day. By this means acute symptoms are usually relieved, and treatment should now be confined to keeping the affected parts clean, and the application of some reliable antiseptic. Carbolic acid, in the proportion of 1 part to 20 of water, has been found serviceable, or ointments composed of boracic acid or bluestone may be employed. In severe cases, where the sloughing process is already well advanced, the loose, gangrenous pieces of skin or horn should be removed by means of a knife or hot iron, leaving the unhealthy tissue exposed to the air. Antiseptics may then be applied, or the diseased parts may be lightly smeared with Stockholm tar. A saline purgative drench of Epsom salts should, as a rule, be administered, and the bowels regulated by allowing a plentiful supply of grass, or laxative feed if obtainable. On account of the lameness, rendering movement extremely painful, it will often be found necessary to cut and carry the feed to the patient. In all cases it is wise to separate the affected animals from the healthy. Cow-yards and milking-bails must be kept thoroughly clean. Old yards should be dug up (or, preferably,

have their surface soil for at least 6 in. depth entirely removed) and well lined, since the accumulated droppings may contain the *B. necrophorus* in abundance, which on the slightest abrasion or injury may easily gain access to the feet.

The treatment of affected pigs may follow on the above lines with necessary modifications. The ulcerated surface should be cleansed, all dead and diseased tissue being removed by scraping, or the *light* application of a hot iron. The wounds may then be dressed with carbolic-acid solution (1 to 20), or dusted over with a powder composed of calomel (1 part) and boracic acid (10 parts). In the case of pigs, the sties should be cleansed and disinfected, and the surroundings dug up and limed. By the adoption of these principles the trouble may be checked, and recovery brought about. Neglect of treatment too often entails the loss of the affected animals.

FACIAL DERMATITIS (FACIAL ECZEMA) IN SHEEP IN NEW ZEALAND.

By H. A. REID, F.R.C.V.S., D.V.H.,
Officer in Charge of the Veterinary Laboratory, Wellington, New Zealand.

THIS disease is characterized by an acute inflammation of the skin covering the face, which may, if the affection be prolonged, become chronically thickened by the deposition of fibrous tissue. The affected parts become finally denuded of hair, and covered by a thick brown scab underrun with pus. The preliminary irritation, by which attention to the prevalence of the disease is first aroused, leads affected animals to attempt relief by vigorously rubbing the face and head against any available objects or on the ground-surface, or by violent scratching with the hind feet, and endeavouring by other forcible means to allay the irritation. The skin in consequence becomes abraded, and the inflammatory condition aggravated, while soil and dirt are introduced into the self-inflicted wounds. The inflammation extends, involving the tissues around the eyes, which receive further injury from the animal in the manner referred to: the resulting conjunctivitis and corneitis may produce blindness. It has been noticed that sheep affected with facial dermatitis are also frequently infested to a severe degree by stomach and intestinal worms. The irritation provoked by the presence of these parasites gives rise to

diarrhœa. This not infrequent combination of gastro-enteritis and dermatitis is often followed by death from malnutrition and exhaustion. The primary cause of this morbid condition appears to be due to some functional disorder of the digestive organs, followed, probably, by the absorption of toxins into the circulatory system. These either interfere with the cellular nutrition of the skin, or act as irritants, setting up an eczematous eruption.

Post-mortem examination of affected sheep reveals often a fatty and congested condition of the liver and kidneys, indicating that disturbance of the secretory functions of these organs has been taking place.

It has been remarked that sheep obliged to partake exclusively of one variety of food are more prone to be affected. Removal to fresh pastures, involving change of feed, generally checks the appearance of further cases, while, provided the disease has not advanced too far, and is not complicated with other disorders, affected animals recover. Recently, by the courtesy of owners, sheep suffering from facial dermatitis in various stages have been forwarded to the Laboratory for further study and observation regarding its nature. In every case examined, an organism corresponding to the *Staphylococcus citreus* has been recovered from the pustular eruption on the face. It has also been noticed that some necrosis of the skin and subcutaneous tissue accompanies the inflammatory lesion. In the depth of this necrosed tissue the presence of an organism identical with that of the necrosis bacillus has been observed.

Sheep inoculated experimentally with a pure culture of the staphylococcus have developed typical pustular eruptions, and the *Bacillus necrophorus* has been found in the lesion, associated with the coccus employed to inoculate the animal. I have also been able to produce identical lesions in the thigh of an experimental sheep by inoculation, after scarification, of an emulsion of its own dung. The ubiquitous nature of the necrosis organism has been referred to under the account of Bacterial Necrosis. There seems little reason to doubt that the same organism is implicated in promoting the pathological changes in facial dermatitis. It appears probable that the eczematous condition permits the cocci normally present on the skin to exercise their pyogenic properties, the necrosis bacillus gaining access to the diseased

tissues through the self-inflicted abrasions. In certain districts the larvæ of the sheep maggot-fly (*Œstrus ovis*) have been blamed for setting up this condition. Although not the direct cause, it may be assumed that the presence of the larvæ in the nasal cavities of sheep may be held in some cases partially responsible, the infected animal, by its efforts to allay the irritation produced by the parasite, injuring the facial tissues, and rendering them permeable to the *B. necrophorus*.

Cases Occurring Among Cattle.

Recently, Mr. Lyons, Veterinary Supervisor, Auckland District, has reported a similar condition affecting cattle. In these animals the skin-lesions are apparently not confined to the face, but may also involve the udder and perineum.

Considering how readily the parts affected may be soiled by dirt and droppings, the abraded cutaneous surface would provide a means of access to the necrosis organism, which may take a considerable share in the production of the lesions. I have not had an opportunity to personally observe the diseases attacking bovines.

Treatment.—The treatment of facial dermatitis has already been described in the Departmental Report, 1908, to which I have nothing further to add. Change of pasture on to a different variety of feed, and the application of an anodyne and antiseptic lotion—such as creolin or lysol—in fairly strong solution, usually promotes recovery. In the treatment of the disease in cattle, Mr. Lyons has found good effects result from local application of zinc ointment.

THE NEW OPERATION FOR ROARING—A QUESTION IN HISTORICAL ACCURACY.

By W. L. WILLIAMS,

Professor of Surgery in the New York State Veterinary College, Cornell University, Ithaca, N.Y.

There has recently appeared in the veterinary journals of England a series of articles in reference to a new, or old, operation for roaring, in connection with which the writer's name has been used, sometimes with credit, at others with discredit.

Hobday [8] says: "The extraordinary success which has,

however, followed a brief series of cases which have been operated upon by the method originally suggested by Dr. W. L. Williams. . . ."

Sutton [18] says: "The operation I wish to bring to your notice to-day is briefly described in Fleming's book as having been performed by the Günthers early in the nineteenth century. Why it fell into disuse it is hard to say. . . ."

Wooldridge [26] says: "This (*i.e.*, Günther's) is the operation we propose to perform to-day. It has lately been *re-introduced* by Professor W. L. Williams."

Woodruff [27] states: "It is not a *new* operation at all, for it was first performed and described by K. Günther, of Hanover, as a result of experiments which he began in 1845. Fleming says of this operation: 'Finally they (the Günthers, father and son) endeavoured to bring about a firm adhesion between the inner surface of the thyroid and the outer surface of the arytenoid cartilage by excising the laryngeal sac, but leaving the vocal cord intact.'

"Being uncertain in its results, the operation fell into disuse, but has recently been *revived*, and performed with considerable success by Professor W. L. Williams, of New York."

The editor of the VETERINARY NEWS [20] states: "Much interest has been aroused recently by a *revival* of some laryngeal operations for the relief of roaring"; and again, under the *nom de plume* of Verb. Sap. [21] says: "This was not a *new* operation, but simply a *revival* of an operation devised by the Günthers more than fifty years ago. . . ."; and again [22] says editorially: "The question has often been raised as to which term should be applied to a horse operated upon by Günther's method for roaring, and made able to gallop without 'making a noise.'"

Spicer [17] says: "The method employed was that initiated by Professor Woodruff"; and Robertson [16] says: "The late Principal Williams, in one or two instances, merely excised the mucous membrane of the left laryngeal ventricle, and I believe this operation was extensively performed by Mr. Edward Cotterill, surgeon, of Bicester."

The above statement by Hobday is faithful in every detail to a verbal communication made by the writer at the time when the operation was demonstrated to Hobday, in September, 1909.

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The writer consequently assumes full responsibility for the statements of Hobday as to the origin of the operation, and will cheerfully answer to the veterinary profession for anything in that statement which is incorrect or unethical. So far as it appears in the periodical veterinary literature of England, the pure Americanism of this operation went unchallenged so long as it was considered a harmless farce, but as soon as it seriously threatened to be successful it changed its nationality like a fugitive from justice. Sütton, Wooldridge and Woodruff declare that it is of German origin; Spicer claims that it was "initiated" by an Englishman; and Robertson is sure that the credit belongs to a Scotchman.

Sutton [18], Wooldridge [26], and Woodruff [27] apparently depend upon the statement of Fleming [4], as quoted by Woodruff [27], as a basis for their assertions. Fleming [4] does not state, however, that Günther "introduced," "established," or "recommended" any such operation, but clearly otherwise; then he further says: "On the whole, the results obtained by the Professors Günther were unfavourable." While Fleming [4] says that Günther [5] excised the laryngeal sac and retained the vocal cord, he does not give the technique and offers no data which can in any way identify the experiment of Günther [5] with the operation now being performed in England.

The present status of the operation in England is conclusive proof of the non-identity with the experiment of Günther. When Hobday first made his announcement of the successful outcome in a few horses, a storm of criticism burst forth, seriously questioning the efficacy of the operation and predicting that ultimately it would share the fate of all preceding operations for roaring. Those doubts and criticisms are now stilled, and English veterinarians, as seen in the columns of the veterinary journals, admit that the operation is a success, and after only a year an astonishing number of horses are reported cured from roaring. A distinguished teacher of surgery in Great Britain assured the writer in 1909 that he had no faith in any operation for roaring; in 1910 a London instrument firm advertises the set of instruments for roaring as used by the eminent Professor. The degree of recovery is of a far higher order than has heretofore been recorded, so that now the hunter follows the hounds over hedge and ditch, and fen and moor, without betraying any

abnormal sound in breathing, which is certainly in marked contrast to practically all of the so-called cures which have heretofore been recorded. The operation has become so successful that, for the first time in the history of veterinary surgery, veterinarians and the editors of veterinary journals [21] are asking the question "If a horse is made sound by the new-old operation, is he sound or unsound?" Indeed the operation has become what might be termed *alarmingly successful,* and is taxing the ingenuity of some veterinarians to find a way foı detecting roaring where it does not exist. As a contrast, Günther [7] commenting upon the inadequate claim of Möller [13] that he had cured a majority of his cases by arytenectomy, though they still made a noise when exerted, says: "Das heisst doch mit anderen Worten; 'Vom Kehlkopfpfeifen sind sie gebeilt, nur darf man sic nicht untersuchen, sonst rohren sie!" (They are cured of roaring, only one dare not test them, lest they roar!) The energetic veterinary profession of Great Britain would not have permitted an operation of so great value to become dormant for half a century after it had once been introduced. Something new is occurring in England.

Cadiot [1]; Cadiot, translated by Dollar [2]; Dollar [3]; Hoffman [12;] Moeller [13]; Moeller, as translated into the French by Cadiot [14]; Vennerholm [19]; and all other writers we have been able to consult, agree with Fleming that Günther's work was confined to experimental operations, which practically always failed and were never applied clinically, and that Günther did not *establish, introduce,* or *recommend* any form of operation for roaring.

A footnote on page 137 of Fleming's work [4] indicates that his statement is based on a footnote on page 96 of Günther's *Myologie* [5], which reads: "Die Stimmtasche zwischen Schild- und Giesskannenknorpel entfernt, aber das Stimmband geschont (der hinter Rand des Giesskannenknorpels wurde dabei regelmässig bis nahe unter die Artikulationsfläche des Giesskannenknorpels von der Kehikopfwand getrennt, so dass er aufwarts nur durch die Kehlkopfsschleimhaut und abwarts durch das verdünnte Stimmband mit dem Schildknorpel in Verbindung blieb; in einzelnen Fällen heilte die aussere Flache des Giesshannenknorpels sehr gut an den Schildkronpel fest, und die Pferde waren und blieben geheilt, in andern Fällen heilte der

Knorpel zu niedrig an und die Thiere blieben Rohrer, in noch andern Fällen heilte der Giesskannenknorpel nicht fest genug an und die Thiere rohrten mit schloddernden Geräusch." Günther offers no suggestion that he established, introduced, advised, or recommended the operation under discussion. He does not give in detail his technique, but says enough to positively and finally establish the total non-identity of his experimental operation with the operation which the writer demonstrated to Mr. Hobday. When Günther states that the posterior border of the arytenoid cartilage was separated, in the operation, from the thyroid until immediately beneath the articular surface of the arytenoid, so that the arytenoid cartilage remained in connection with the thyroid cartilage above, only through the medium of the laryngeal mucosa and downward by the thinned vocal cord, it becomes very clear that the technique of Günther bore no resemblance whatever to the operation now in use. The latter part of the quoted paragraph shows that the technique was radically different, since otherwise the results recorded by Günther could not have occurred. Conclusive evidence that their work was confined to experiment animals is found in the following paragraph from the same footnote [5]: "Die Versuche sind sehr kostspielig, da nur gute, kräftige Pferde für den Zweck zu verwenden sind, und diese zugleich längere Zeit hindurch gut gefüttert werden mussen. Ich habe von Seiten unserer Anstalt keinerlei Subventionen zu dènselben erhalten, habe sie vielmehr mit einem Kostenaufwande von p.m. 600 Thlrn. ausgefürt."

In the first edition of Günther's monograph upon roaring [6] he states on page 50: "Wegen der Unsicherheit des Erfolges habe ich meine Operationsmethoden niemals empfohlen und habe sie deshalb auch nich von den Studirenden einuben lassen." In his second edition [7], 1896, he repeats this statement, and upon the last page says: "Es ergibt sich sonach, das ein operatives Verfahren auf den bisherigen Wegen nicht zum Ziele führt." He then states that tracheotomy affords the only satisfactory relief.

Thus K. Günther declares over and over again that he never introduced, established, or recommended any operation for roaring, and does not intimate that he ever operated clinically upon a roarer.

The writer has no desire to detract from the fame of the

Professors Günther, who worked for more than half a century upon this problem with unflagging zeal without reaching their goal. They insisted that, if roaring were to be surgically relieved, it must be through some operation upon the arytenoid cartilages, vocal cords, or laryngeal ventricles, and they experimented variously with each. Cadiot, Fleming, Hoffman, Moeller, Vennerholm, and all subsequent investigators worked over the same field which the Günthers mapped out. If finally the riddle has been solved, the solution is a tribute to their labours, a far greater tribute than a declaration that they introduced an operation, which the Günthers themselves emphatically deny.

One other question is raised in the articles mentioned, especially when "Perplexed" [15] says: "At each re-appearance (of operations for roaring), history repeats itself—first a little secrecy, next a boom and a rush, and then a gentle fizzle out." "Perplexed," under the secrecy of a *nom de plume*, hints at unprofessional secrecy in regard to the introduction of the operation into England. So far as the writer knows, Mr. Hobday did not advertise the demonstrations; neither were they done in secret, but in broad daylight, close beside a public highway, with the gates of the enclosure standing open. So far as the writer knew them, or English veterinary journals have indicated since, Mr. Hobday had invited all the veterinarians in England who cared, at that time, to see the operation. It would have been offensive to many English veterinarians to have invited them to witness Günther's operation for roaring, by an unknown American who had never met Günther or communicated with him, and who, at that time, had never seen any one of Günther's works, and consequently knew nothing whatever of Günther's operations.

In a yet broader sense, the operation was not secret. The writer reported his investigation, with clinical statistics, in 1906, to the American Veterinary Medical Association [23]; an amended technique in 1907 [24]; and again, in 1907 [25], the technic was published in the writer's handbook, which was offered to English veterinarians by a leading London publisher, upon whose shelves the book has attracted more dust than attention.

The operation and its results had been the common property of the veterinary profession for three years when the demonstra

tion was made in London, and if it still remained a secret to "Perplexed" the cause lay at his own door. During the summer of 1909, the writer freely explained the technique and results of the operation to numerous English veterinarians. One man in England (Hobday) had confidence in the operator and operation, and his request for a demonstration was granted with the same courtesy that has always awaited such requests of the writer from any reputable veterinarian, at home or abroad.

The current literature of to-day becomes history to-morrow, and, in behalf of historical accuracy, it is hoped that the English veterinary journals will carefully investigate the source of origin of the operation for roaring now being performed in England, and place the facts clearly on record.

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EXPERIMENTS TO ASCERTAIN IF CATTLE MAY ACT AS A RESERVOIR OF THE VIRUS OF SLEEPING SICKNESS (*TRYPANOSOMA GAMBIENSE*).*

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THE question as to whether cattle can act as a reservoir of the virus of sleeping sickness is an important one. It was usually believed until lately that man was the main reservoir, and that the other animals might be ignored. But in view of the fact that the flies on the Lake-shore have remained infective for some two years after the native population have been removed, it is necessary to inquire if it is not possible that other animals may act as well.

In this regard cattle have been, perhaps, the most important, as on the once thickly populated Lake-shore and islands they were numerous, and in many cases grazed and watered in the fly-area. Another reason of their importance is, that if they can act as a reservoir, then the

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same will probably be true of the different species of antelope which inhabit the Lake-shore. It may be presumed that these will greatly increase now that the natives and domestic animals have been removed, and that they will take the place of the cattle in keeping up the infectivity of the *Glossina palpalis.*

The Commission, therefore, thought it would be well to inquire into the question, and the result is given in this paper.

Answers to the following questions were sought: Are cattle capable of being infected with sleeping sickness by the subcutaneous injection of blood containing *Trypanosoma gambiense?* Can cattle be infected with sleeping sickness by the bites of artificially infected tsetse-flies? Can cattle be infected with sleeping sickness by the bites of the naturally infected flies caught on the Lake-shore? Is it possible to infect tsetse-flies by feeding them on cattle infected with sleeping sickness, and afterwards to transmit the disease by means of these flies to healthy animals? Finally, if these questions are answered in the affirmative, will it be possible to find that cattle which have lived in the fly-area are naturally infected with sleeping sickness?

(I.) Are Cattle capable of being Infected with Sleeping Sickness by Subcutaneous Injection of Blood containing *Trypanosoma gambiense?*

Experiment 869. *Bull.*

September 10, 1909.—A bull was inoculated with 5 cc. of blood containing large numbers of *T. gambiense* from an infected monkey.

Its blood was examined daily, and 18 days after injection the bull was found to be infected with *T. gambiense.* The identity of the trypanosome was established by injecting a monkey with some blood from the ox. This monkey showed *T. gambiense* on the sixth day.

Conclusion.—From this experiment it is seen that oxen are capable of being infected with sleeping sickness by the injection of blood containing *T. gambiense.* The trypanosome appears in small numbers in the blood, and the blood, when injected into susceptible animals such as monkeys, gives rise to a fatal form of the disease.

(II.) Can Cattle be Infected with Sleeping Sickness by the Bites of Artificially Infected *Glossina palpalis?*

The two following experiments were carried out by feeding *G. palpalis* first on an infected monkey, and immediately afterwards on a healthy ox. Wild flies from the Lake-shore were used.

Experiment 890. *Ox.*

May 20, 1909.—The ox was thrown and a monkey heavily infected with sleeping sickness was laid across its flank. Two cages of *G. palpalis*, containing 100 and 150 flies respectively, were allowed to feed for a few seconds on the monkey and then on the ox. The flies were allowed from 30 to 35 interrupted feeds on each animal every day. This was continued for 38 days, during which time 561 flies were estimated to have fed on one or other animal.

July 17.—Fifty-eight days after the first infected feed *Trypanosoma gambiense* appeared in the blood of the ox.

The identity of the trypanosome was established by injection of the ox's blood into two monkeys. The first monkey was injected with blood from the ox 76 days, and the second monkey 181 days after the flies had first fed on the ox. Both monkeys developed sleeping sickness, the first seven days and the second 11 days after injection of the blood.

Experiment 891. *Calf.*

The details of this experiment were similar to those of the last. *T. gambiense* appeared in the blood of the calf 57 days after the flies had been first fed upon it.

Three cubic centimetres of the blood of the calf were injected into a monkey, and the monkey developed sleeping sickness after an incubation period of eight days.

Conclusion.—These two experiments show that when artificially infected *G. palpalis* are allowed to feed on healthy cattle, these animals develop sleeping sickness, and that the blood of the cattle is capable of giving rise to infection of *T. gambiense* in monkeys when injected into them.

(III.)—CAN CATTLE BE INFECTED WITH SLEEPING SICKNESS BY THE BITES OF THE NATURALLY INFECTED FLIES CAUGHT ON THE LAKE-SHORE?

In the next three experiments freshly caught *G. palpalis* brought up to the laboratory from the Lake-shore were allowed to feed straightway on healthy cattle. By this means it will be shown whether *G. palpalis* in their wild state are capable of giving sleeping sickness to healthy cattle.

Experiment 982. *Bull.*

2,195 freshly captured *G palpalis* were applied to a bull, and of these 1,536 were estimated to have fed. The feeding of the flies

extended over a period of 16 days, at the end of which time *T. gambiense* appeared in the blood of the bull.

To help in the identification of this trypanosome 3 cc. of the blood of the bull were injected into a monkey. The monkey developed sleeping sickness 18 days later. 5 cc. of the blood of the bull were also injected into a goat. *T. gambiense* appeared in the blood of the goat after an incubation period of 38 days.

Experiment 1,462. *Bull.*

The details of this experiment were similar to those of the last one. Over a period of eight days 1,370 wild flies from the Lake-shore were applied to the bull, of which 705 fed. Ten days from the first application of flies *T. gambiense* appeared in the blood of the bull.

Two animals, a monkey and a goat, each received 1 cc. of the blood of the bull by injection under their skin. The monkey developed sleeping sickness seven days later, but the goat died in 16 days without showing any infection.

Experiment 1,465. *Bull.*

During a period of 13 days, 459 freshly caught Lake-shore *G. palpalis* were applied to a bull, and of these 314 fed. On the 14th day after the flies were first fed the bull developed an infection of *T. gambiense.*

Some blood from this bull was injected into a monkey and into a goat. Neither animal became infected.

Conclusion.—These experiments prove that *G. palpalis*, when captured in their natural state on the Lake-shore, are capable of transmitting the virus of sleeping sickness to cattle, and that the blood of these cattle gives rise to a fatal form of the disease in monkeys and goats when it is injected into them.

(IV.)—Is it possible to Infect Tsetse-flies by Feeding them on Cattle Infected with Sleeping Sickness, and afterwards to Transmit the Disease by means of these Flies to Healthy Animals?

Five experiments nnder this heading were carried out. Laboratory-bred flies were used in all of them. Three were negative and two positive. The three negative experiments will be shortly summarized first.

Experiment 1,451.

Ninety laboratory-bred *G. palpalis* were fed for ten successive days on a calf whose blood contained *T. gambiense.* The flies were starved

for 72 hours. They were then fed on a clean monkey daily for 45 successive days. The monkey failed to develop sleeping sickness.

When the remainder of the flies were dissected, one contained flagellates, but when the contents of this fly were injected into a goat the animal failed to show any infection of *T. gambiense.*

Result.—Negative.

Experiment 1,269.

The details of this experiment were similar to those of the last After the *G. palpalis* had been fed on two oxen whose blood contained *T. gambiense*, they were applied daily to a monkey. They were fed on this monkey for 35 consecutive days and were then transferred to a second monkey. Both the monkeys remained healthy.

Two of the flies were found on dissection to contain flagellates, but when these were injected into a monkey and a goat no development of sleeping sickness took place in these animals.

Result.—Negative.

Experiment 1,672.

Here again the technique was similar to the last. The *G. palpalis* were fed on alternate days for a lengthened period, on a clean monkey and a clean goat. Both animals remained healthy.

Some infected flies were found on dissection, but when introduced under the skin of a goat and of a monkey did not give rise to sleeping sickness.

Result.—Negative.

The next two experiments, which were carried out in the same way as the two preceding ones, were positive.

Experiment 1,566.

The *G. palpalis* were fed on an infected ox, and after a starve of 72 hours were fed on a clean monkey for 45 successive days. Sixty-eight days after the flies had taken their first infected feed this monkey developed sleeping sickness.

When the flies came to be dissected nine of them showed flagellates either in the proboscis or in the alimentary tract. Some of these were injected into goats and into a monkey, but with negative results.

Result.—Positive.

Experiment 1,602.

Fifty laboratory-bred flies were fed for four successive days on an ox whose blood contained *T. gambiense.* After a period of starvation

they were applied to a monkey and to a goat on alternate days. The monkey died before it could have become infected, but the goat developed sleeping sickness 20 days after the flies had their first infected feed.

The remainder of the flies, 32 in all, were dissected, and five were found to contain flagellates. The alimentary contents of one of these flies were injected into a monkey, and after an incubation period of 13 days *T. gambiense* appeared in its blood.

Result.—Positive.

Conclusion.—Laboratory-bred tsetse-flies can be infected by feeding them on cattle infected with sleeping sickness, and afterwards the disease can be transmitted to healthy animals by means of these flies.

(V.) Do Cattle, when Living in the Fly-area, actually carry the Virus of Sleeping Sickness?

About seventeen cattle from various sources were examined with this point in view. Not all these cattle could be proved to have been exposed to the bites of *G. palpalis*, but most of them came from places where these flies are plentiful. One was positive.

Experiment 1,633.

This cow came from the island of Kome, in Lake Victoria, where human sleeping sickness is prevalent and where *G. palpalis* abound.

T. gambiense was found in its blood by microscopical examination, and when 3 cc. of the blood were injected under the skin of a monkey the animal developed sleeping sickness after an incubation period of seven days.

Conclusion.—This experiment proves that cattle in their natural state, and apparently in good health, may harbour the virus of sleeping sickness.

General Conclusions.

It has been proved by experiment that cattle may act as a reservoir of the virus of sleeping sickness, and that healthy animals may be infected from them by means of *G. palpalis.*

It has also been proved that cattle in the fly-area do naturally harbour *G. gambiense.*

It is, therefore, possible that the cattle and antelope living in the fly-area may act as a reservoir, and so keep up the infectivity of the *G. palpalis* for an indefinite period, but there is no proof up to the present that this actually takes place in Nature.—*Journal of the Royal Army Medical Corps.*

RABIES AND ITS CONTROL IN INDIA.

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Rabies is an acute specific disease to which all mammals are susceptible, although it affects more particularly the canine species. In most countries its continued existence is bound up with this species, and although the disease is common amongst certain wild animals (in India—jackals), it is probable that the dog is the natural reservoir, and if the disease were stamped out in the latter species it would probably also die out in the wild animals in which it is known to exist at present.

Etiology.—The causal organism of the disease has not yet been discovered and hence it is customary to speak about the "virus" of rabies, although it is now universally admitted that the cause of the disease is an organism, and this latter must be an obligatory parasite since the disease never occurs spontaneously. Rabies therefore belongs to the group of diseases caused by the "ultra-visible viruses."

Remlinger,* in 1903, showed that the virus of rabies was filtrable, although prior to this year such was not believed to be the case. He found that the virus of rabies failed to traverse the close-grained Chamberland B and F filters, but proved that under certain conditions the virus is not arrested by the more open-textured Berkefeld filter.

Remlinger partly confirmed the results of earlier observers, and his results also were subsequently confirmed by still other observers (Betarelli-Maggei). Knowledge of the above facts might be usefully employed in endeavouring to arrive at a diagnosis from brain material, which has become too putrid to inoculate without previous filtration. The open-textured Berkefeld filter would arrest putrefactive organisms, whilst allowing the rabies virus to pass. By using such a filtrate for inoculation experiments, the danger of the experimental animals dying from septicæmia before the result of the inoculation of the rabies virus, if present, could be observed, would be obviated. Up to the present time it has not been found possible to cultivate the rabies virus artificially.

Method of Infection.—The natural method of infection is by

* *Annales de l'Institute Pasteur*, 1903.

inoculation, the inoculating agent being almost invariably the tooth of a rabid dog, the inoculated material being saliva. This is the only natural method of infection. It is possible, however, for infection to be brought about by the application of saliva to an abraded surface. Hence the danger of allowing oneself to be licked by a dog, even should the dog, to all outward appearances, seem healthy. However, I shall refer again to this point later.

Distribution of the Virus in the Body.—The virus is found in the central nervous system, the medulla oblongata being its chief seat of propagation. It might here be remarked that when forwarding a piece of brain from an animal suspected of rabies for examination and report, it is best to select the piece from the back part of the brain.

The virus is also abundantly present in the salivary secretion.

The peripheral nerves also sometimes contain the virus, and it is also sometimes present in other secretions than the salivary —*e.g.*, the milk of rabid animals is sometimes infective. The blood is non-infective.

Rabies differs from the majority of other microbic diseases in the way in which the causal virus travels to the central nervous system when inoculated in any dependent part of the body —viz., by way of the nerve trunks and not by way of the vascular or lymphatic circulation.

This is an important factor to be remembered with regard to rabies for the following reasons: The further away from the central nervous system that a bite is inflicted the longer is the period of incubation, and this point is not lost sight of in applying antirabic treatment. Patients who have been bitten about the face or neck are submitted to a more drastic treatment than those bitten in parts further removed from the central nervous system. The treatment is in these former cases made more drastic by the use of vaccine material, the virus of which has been less attenuated than is the case with the ordinary vaccine used.

Period of Incubation varies within wide limits. May be taken as roughly between three weeks and six months, although cases are on record of the period of incubation running into a year or more, and it has been said that there have been cases in the human subject in which the period of incubation has been several years.

However, the fact of a dog having been bitten by a rabid dog a year prior to its developing clinical symptoms of rabies is no proof whatever of that period being the period of incubation, since it is impossible to keep a dog under such close observation for so long a period, so that one could affirm that it had not been bitten again at a later date. From personal observation I should be more inclined to favour this latter supposition, especially if such a case occurred in a country rife with the disease, and should view with grave doubt any report of such a long period of incubation having occurred unless the proof of it were incontrovertible. For practical purposes I consider that six months is a safe period to allow as the longest probable period of incubation.

Symptoms.—Rabies in dogs is manifested in two different forms, which are distinguished as furious and dumb rabies.

Furious Rabies.—The premonitory symptoms of this form, as well as of the dumb form, are more or less identical. The first noticeable symptom is a change in the disposition of the animal. This first change is not characterized by a disposition to bite; an the contrary, it is usually manifested by dulness and apathy. The lively dog becomes dull and listless, and the usually unexcitable, undemonstrative animal may become more affectionate and show a disposition to fawn upon its owner. The noisy dog becomes perhaps suddenly quiet, whereas a usually quiet dog may take to growling without apparent cause. These slight variations in the normal disposition of a healthy dog can be enlarged upon *ad infinitum*, but to sum them up—any sudden and capricious change in the disposition of a dog in a country where rabies is common should at once be viewed with strong suspicion, and steps should immediately be taken to segregate the animal until a definite diagnosis can be made. Nervousness, manifested by increased sensibility to sound and restlessness, is very suspicious of rabies. A depraved appetite is an almost invariable symptom. A rabid dog will swallow all sorts of things foreign to his usual tastes—*e.g.*, straw, bits of string, paper, stones, &c., &c., and the presence of such bodies in the stomach in *post-mortem* examination of a suspected case is very strong evidence in support of the diagnosis rabies. It is said that rabid dogs have a disposition to bay the moon and that their voice has a peculiar sound. Personally I have never observed either of these phenomena, and should pay little attention to such as

evidence in support of the disease being rabies. In these early stages the dog still recognizes his master's voice and will obey it, although sullenly and without the usual pleasure and promptness. The presence of wounds which may have been caused by bites can hardly be considered of importance, since few healthy dogs are ever whole-skinned; although, on the other hand, were there a history of the patient having been attacked by a strange dog with resulting wounds, such would then help to swell the evidence. Mental disturbance is usually manifested at this early stage by a vacant expression and snapping at imaginary objects, although the animal may temporarily rally at the sound of a human voice. These nervous symptoms (hallucinations) are intensified as the disease progresses, the patient becomes more restless, reflex excitability and hyperæsthesia are increased, and the animal now becomes aggressive, will bite at any object held up to him, and finally, if at large, will dash off and gallop for miles, attacking any animal or human being who may cross his path. He may finally return to his old haunts exhausted or succumb from exhaustion during the course of his mad career. It is said that a rabid dog will not go out of his way to attack a man or animal, but will only do so should they be in his way. It is safer to assume that a rabid dog may take it into its head to make an unprovoked attack on any living being that may be within the range of its vision, although it is true that the dog's tendency is to get forward without waste of time. I have personally seen a hound bitch deviate from her course to attack a buffalo and other dogs. The rabid dog, however, does not appear to wish to fight it out to a finish, but having bowled over and bitten at its imagined enemy, it continues on its way. Its attack also is silent. These furious symptoms are followed by debility, paralysis, and death. An occasional and characteristic symptom of the furious form of rabies, both in dogs and other animals, is their biting of themselves, and they will frequently lacerate themselves deeply about the breast and forearms.

Dumb Rabies.—In this form of rabies there are no preliminary furious paroxysms. The premonitory symptoms of dulness and altered disposition are the same as in the furious form, but these symptoms are rapidly succeeded by paralysis. Usually the first muscles to become paralyzed are the masseters, as a result of which the lower jaw drops and there is a dribbling of saliva.

There is neither the inclination nor ability to bite. The patient quickly becomes debilitated and emaciated owing to inability to swallow. Paralysis of the hind-quarters usually follow, then prostration and death. Paralysis may commence elsewhere than in the face, but the dropped jaw and drivelling saliva is almost pathognomonic. I have seen many cases of this kind in imported foxhounds in India, and, in fact, in the hills during the hot weather months it appears to be quite as common, if not more so, than the furious form. One may meet with other cases intermediary, so to speak, between the dumb and furious forms.

Diagnosis.—The recognition of rabies in its earliest stages is of the utmost importance, and owing to the danger of spreading the disease which may result from allowing a case to go unrecognized and not taking the necessary precautions, one cannot err on the side of caution.

Should the disposition of a dog become suddenly altered and there is added to this a history of its having been bitten, suspicions should at once be aroused. The later symptoms detailed above enable one to form almost with certainty a correct diagnosis. Any dog, whose habits are usually docile, that makes an unprovoked attack on any human being should at once be suspected.

Having detailed the usual symptoms manifested, it must be added that there are no means of making a positive diagnosis *ante-mortem*, but in the majority of cases the manifestation of any or all of these symptoms, together with certain *post-mortem* appearances to be detailed later, enable one to arrive at a correct diagnosis.

Post-mortem Appearances—Macroscopic.—Congestion of the mucous membrane; absence of normal food-material in the stomach; presence of foreign bodies in the stomach (pieces of straw, stick, rags, stones, &c.). Sometimes the stomach is completely empty, excepting for a little brown-tinged mucus.

The above are usually the only macroscopic lesions observable which are at all diagnostic.

To sum up—the absence of ordinary food material and the presence of considerable quantities of foreign materials in the stomach of a dog that has made an unprovoked attack on a human being leave hardly any room for doubt that the animal was actually rabid. On the other hand, the presence of a con-

siderable quantity of ordinary food is rather strong evidence against the existence of rabies.

Microscopic Lesions.—In 1886 Babes* concluded, as a result of numerous researches in man and dogs, that the essential lesion of rabies consisted in an accumulation of embryonic cells in the neighbourhood of the central canal, and especially about the large modified cells of the motor centres of the bulb ~~and cord~~. In 1892 he reaffirmed his observations, and held that it was possible to make a rapid diagnosis of the disease by a microscopic examination of the bulb and cord. He described in the bulb what he considered the diagnostic lesion of the disease, viz., pericellular accumulations of embryonal cells. The cells of the bulbar nuclei undergo degeneration and present various stages of chromatolysis. There is a loss of the prolongations and a progressive modification and even total disappearance of the nuclei, a dilatation of the pericellular space, and an invasion not only of this space, but also of the nerve-cells and embryonal cells, and at the same time small corpuscles which are hyaline, brownish, and in parts metachromatic. Many of the nerve cells become surrounded by a large zone of embryonal cells, and when the cell is completely degenerated these occupy the cell area and constitute the rabic tubercle. Nélis and Van Gehuchten first noted what they considered to be a more diagnostic lesion of rabies than any other—*i.e.*, the most profound, constant, and earliest lesions are noted in the peripheral, cerebral, and sympathetic ganglia, and the changes are specially marked in the intervertebral ganglia and in the plexiform ganglia of the pneumogastric nerve. The characteristic changes consist in the atrophy invasion and the destruction of the nerve cells brought about by new-formed cells derived from the capsule which appear between the cell body and its endothelial capsule. These new-formed cells invade the nerve cell and finally occupy its entire capsule.

Cuillé and Vallée found that in animals in which the disease had just become manifest the lesions in the plexiform ganglia were slight or absent. They concluded that as a means of diagnosis the method of Van Gehuchten and Nélis has great value in the case of animals in which the disease has run its full course, ending in death.

* *Journ. of Comp. Path. and Tech.*, Vol. xiv., p. 37, "The Rapid Diagnosis of Rabies," by Mazÿck P. Ravenel, M.D., and J. McCarthy, M.D.

The work of Nélis and Van Gehuchten was confirmed by Ravenel and McCarthy—purely contributory evidence. Cerebral ganglia show the most marked lesions, notably that of the pneumogastric nerve.

Rabieaux* also confirmed these operations. The experience of Rabieaux and of all the other authors who have investigated the subject shows that the practical value of this method of diagnosis varies according to the nature of the case. If the suspected animal has been killed at an early stage of the disease its value is very restricted, for the lesions are then at the most very slight and most frequently entirely absent. Consequently the non-detection of the lesions never justifies one in pronouncing the case not rabies. On the other hand, in the case of animals that have died, the before-described lesions are constantly present, and such lesions have not hitherto been observed with certainty in animals dead from other diseases than rabies.

In March, 1903, Négri announced that in many nerve cells obtained from rabid animals it was possible to detect corpuscles having special staining properties. These Négri described as the parasite of rabies. They appear as oval, rounded, or kidney-shaped bodies varying from 5 to 27 or 30 microns in diameter, lodged in the protoplasm close to the nucleus. These corpuscles are strongly refractile, and appear to contain granules in their interior. The number in different cells varies, and from ten to fifteen may be present in one cell. These corpuscles can be found in all parts of the nervous system, but are most numerous and constant in the large pyramidal cells of the hippocampus. They exhibit special staining properties. Négri held that the presence of these corpuscles afforded a rapid method of diagnosis. He admitted, however, that in rare cases these characteristic corpuscles could not be demonstrated, although the animal might be proved to be rabid. Other authors have confirmed Négri's statements, and all are agreed that the corpuscles can only be found in rabid animals.

Forgeot and Nicolas† investigated this subject and came to the following conclusions:—

(*a*) The corpuscles are never found except in cases of rabies.

(*b*) When found in the hippocampus of a suspected animal a positive diagnosis can be made.

* *Journal de Méd. Vét.*, December, 1902.

† *Journal de Méd. Vét. et de Zootech.*, September, 1905.

In an article entitled "The Etiology and Diagnosis of Hydrophobia" (*Journal of Infectious Diseases*, vol. iii., 1906), Anna W. Williams and May M. Lowden confirm the above observations, but state also as follows:—"The significance of the bodies is still in doubt for the following reasons: (*a*) They have not been found in all cases of hydrophobia, notably not in the fixed virus, nor in all parts of the nervous tissue proved to be virulent; (*b*) forms small enough to pass through the coarser Berkefeld filters have not been seen; (*c*) the structure has not been definitely shown to be analogous to that of known living organisms; (d) no definite series of forms indicating growth and multiplication have been demonstrated."

Evidence, therefore, is against these bodies being living parasites.

From the foregoing remarks on the nervous lesions it will be gathered that both the rabic tubercles of Babes and the corpuscles of Négri form valuable aids to diagnosis, but that negative results of histological examinations do not justify a verdict of not rabies.

The only absolutely certain method of proving whether or not an animal was rabid is by experimental inoculation. The material inoculated is a piece of spinal cord or medulla—preferably the latter—from the suspected animal, and the rabbit is the animal selected for the inoculation. A small quantity of an emulsion in bouillon or water of the brain of the suspected animal is inoculated subdurally after trephining into not less than three rabbits. Strict aseptic precautions are necessary. Provided that the inoculated rabbits survive a sufficient length of time—*i.e.*, the usual period of incubation of fourteen or fifteen days—and that the dog from which the brain material used for the inoculation was the subject of rabies, the inoculated rabbits will infallibly develop rabies (McFadyean).

The period of incubation in the rabbit inoculated with brain material from a natural case of rabies in the dog is usually about fourteen or fifteen days, and the period of visible illness one or two days.

The symptoms are those of gradual paralysis, commencing usually in the hind-quarters and rapidly extending forwards. As a rule, there is no cerebral disturbance and there is no propensity to bite.

Possible causes of failure are in cases in which the brain used for inoculation is partially putrid. In these cases the putrefactive organisms will almost certainly cause the death of the inoculated rabbit from a local inflammation of the membranes of the brain within a few days, whereas for the success of the operation the rabbits inoculated must survive at least a fortnight, and also must not be the subject of any other cererbal disturbance.

For the above reason, when forwarding a portion of brain material of a suspected case to a laboratory for inoculation purposes, it should be placed in pure glycerine. This latter substance possesses a double advantage. It can preserve the virus of rabies for about a month and a number of putrefactive organisms lose their vitality when immersed in it.

Treatment.—There is no treatment for dogs the subject of rabies, and even if there were any drug known to be efficacious in a proportion of cases, treatment would never be justified owing to the great danger of keeping a rabid animal alive, a danger both to the attendant and, should the patient by some accident get at large, to other animals and human beings.

A dog showing all the clinical symptoms of rabies should be immediately destroyed and the carcase burnt.

There are certain cases, however, in which it is very necessary to have the diagnosis confirmed, either microscopically or by experimental inoculation. The following are such cases:—

(*a*) Should the dog be known to have bitten other dogs, their confirmation is necessary in order that prophylactic measures may be taken with regard to the dogs bitten. Reference will be made to these measures later.

(*b*) Should any human being have been bitten or licked on an abrasion by a dog suspected of rabies, confirmation of the diagnosis should also be obtained. The reason of this is obvious, viz., the person bitten is relieved of anxiety should it be proved that the case was not one of rabies, and if the said person were already undergoing antirabic treatment the latter would be immediately stopped.

Therefore if there is no evidence forthcoming that any human being or other animal has been bitten by a dog destroyed on account of its having shown clinical symptoms of rabies, one is justified in allowing the diagnosis to rest on the latter, and no further precaution need be taken. If such evidence, however, is

forthcoming, then material should be forwarded at once to the nearest laboratory, with the history of the case, for the latter to be confirmed or otherwise. The procedure is as follows:—

It has already been pointed out that there are two methods of diagnosing rabies *post-mortem*, viz., microscopical and experimental. Brain material is necessary for both these methods of examination. When destroying the dog, therefore, the cranium should be mutilated as little as possible.

Major George Lamb, M.D., I.M.S., Director Pasteur Institute, Kasauli, in his pamphlet entitled "Rabies and Antirabic Treatment in India," August 1, 1908, gives the following instructions for the removal and getting up for despatch the brain of a supposed rabid animal:—

"The first procedure, therefore, is to open the skull and expose the brain. First wash the head well with an antiseptic such as carbolic acid, phenyle, &c. Then take a hammer and with a few hard sharp blows fracture into many pieces through the intact skin the top and sides of the brain cavity. With a knife throw back the skin and then remove as carefully as possible the pieces of fractured bone, in this way exposing the brain. For the experimental method with a clean knife remove a small piece of brain about the size of a bean and place it in a small bottle of pure glycerine. On no account is an antiseptic to be allowed to come in contact with the piece of brain, nor is anything to be added to the glycerine.

"For the microscopical method a special portion of the brain is desirable, viz., the hippocampus major. As this is somewhat difficult to dissect out by anyone unaccustomed to such work, it is best to remove the brain entire. It should at once be put into a wide-mouthed bottle containing a plentiful supply of the following solution:—

Bichromate of potass.	90 grains.
Glacial acetic acid	$2\frac{3}{4}$ fluid dr.
Water	$6\frac{1}{2}$,, oz.

"In removing the brain of a rabid animal the greatest care must be taken not to allow the saliva or brain substance,, both of which, as we have seen, contain the rabies virus, to come in contact with any cuts or abrasions on the hands."

If the above instructions cannot be carried out in detail, the rougher and readier method of simply exposing the brain by the

removal of the anterior wall with a chisel and hammer, and the removal of a piece of the back part of the brain (medulla) under aseptic precautions, placing it immediately in pure glycerine and forwarding it to the laboratory, answers all practical purposes. It must be remembered that in most instances the brain will be considerably mutilated owing to the dog being unavoidably destroyed by shooting. In other cases the dog has perhaps had his brain battered in by sticks or stones, and may have been dead several hours before he is seen by a veterinary surgeon. In the latter case, as putrefaction in a tropical climate is so rapid, the brain substance is already infected, and hence the precaution of washing the skin before exposing the brain can hardly be considered necessary.

TREATMENT OF A PERSON BITTEN BY A DOG SUSPECTED OF RABIES.

In giving advice concerning the state of health of a dog which has bitten a human being, one is justified in erring on the side of safety, and if there is the slightest ground for suspicion that the dog in question, although at the moment of biting showing no pronounced clinical symptoms of rabies, might possibly be in the incubative stage of the disease, it is far better to exaggerate rather than minimize the possibility of infection to the person bitten. It must be remembered that there are many people who are not of a nervous disposition, and who will jump at any excuse rather than undertake a journey to a Pasteur Institute for antirabic treatment, the journey involving a good deal of discomfort and expense. Should any such person, owing to a hesitating opinion given by a veterinary officer, decide to take what might be a small risk and not undergo treatment, or delay making the journey until the suspected dog should show more definite symptoms—in either case with fatal results—the aforementioned veterinary officer would, under such circumstances, be very much to blame.

The wounds inflicted by any dog, whether suspected of rabies or not, should be immediately cauterized with pure carbolic or some other reliable caustic. In the case of a person bitten by a dog apparently in the best of health, and concerning which suspicions are not aroused, no further treatment is necessary provided the dog in question remains in good health for the succeeding ten days.

In the case of a person bitten by a dog to which the slightest suspicion can attach, that person should be advised to proceed immediately to the nearest Pasteur Institute for treatment. The dog meanwhile should be securely fastened and segregated and not destroyed. If the actual fact of its having bitten a person unprovoked is a clinical symptom of rabies, then within the following ten days the animal would develop unmistakable signs of the disease, in which case he should be destroyed and the brain forwarded to the Institute to which the person bitten has proceeded for verification. It must be remembered that the success of the treatment depends on the time which elapses between the moment of the infliction of the bite and the moment of commencing treatment. Hence there should be no delay.

If a dog which has bitten a person, the latter having proceeded to the nearest Institute for treatment, should be in the best of health ten days after having bitten such person, the fact should be communicated by wire to the Institute so that treatment can be suspended.

In the case of a dog which has been beaten to death after biting any human being or other animal, the brain should always be sent to the Institute if possible. This allows of the treatment of any person or persons being suspended should the case prove not to be one of rabies after experimental inoculation.

The Moment at which the Saliva of a Rabid Animal Becomes Infective.

Cases have been reported of infection resulting from the bite of a rabid dog many days before the dog actually showed clinical symptoms of the disease.

In 1890 Nocard and Roux showed that the mixed saliva is always virulent 24, and sometimes 48, hours before the appearance of any change in the appearance of the dog.

In 1901 Rabieaux and Guinard showed that siliva from the submaxillary gland, removed aseptically from an opening in Wharton's duct, might be virulent for two days before the appearance of any symptoms.

Nocard, Roux, and Nicolas noted that the appearance of fever indicated the secretion of virulent saliva.

The work of Nocard, Roux, Guinard, and Rabieaux and Nicolas show that the moment of infectivity of the saliva is variable.

The question, however, is a most important one, since it must be determined what is a safe period to allow between the moment of a dog, apparently healthy, biting a person and the moment of its showing clinical symptoms of rabies, before it is considered necessary for such person to undergo antirabic traetment.

To be licked on an abrasion must be looked upon as equally dangerous as a bite from the point of view of treatment.

Professor Galtier, of Lyons, always advised Pasteur's treatment being carried out on every person bitten within a period of eight days before the appearance of symptoms in the offending animal. This is certainly a safe period to adopt.

(*To be continued.*)

Clinical Articles.

OPHTHALMIA IN TETANUS.

By S. J. MOTTON, M.R.C.V.S.,

Penzance.

CHANGES in the eye occur in many diseases, but apart from the protrusion of the membrana nictitans, I have not seen anything recorded in connection with the eye in tetanus.

On October 10 of last year, an eight-year-old general purpose mare, was brought for inspection. The owner complained that for several days the mare had been moving stiffly.

The membrana nictitans covered almost the whole eye when her head was raised. Her jaws could be opened to only half the normal distance, the tail was elevated, and she walked with her hind legs widely separated.

Tetanus was diagnosed—the mare was placed in a box and treatment commenced. On October 16 she was much worse and was placed in slings. On October 19 (nine days after the first inspection) the cornea of the near eye was observed to be cloudy, and on the next day the off cornea was similarly affected. There was a thick, but not very abundant, discharge from both eyes, and in two or three days each cornea had assumed a pale yellow colour. The mare was now quite blind. In another week the opacity began to pass away.

On November 16, the animal was taken out of slings and made a good recovery. By the end of December the sight of both eyes was quite good. The right cornea was normal. The

left cornea was slightly blemished by a yellow speck about half the size of a B.B. shot.

Zinc-sulphate lotion was the only material applied to the eyes.

A CASE OF ABDOMINAL ABSCESSES IN A HORSE.

By Captain E. S. GILLETT, M.R.C.V.S.,

Army Veterinary Corps, India.

Subject.—Coarse-bred Australian gelding, four years old.

History.—Landed in India, January, 1910. He proved a very difficult horse to get into condition, although he carried a good coat and to all appearances was healthy.

In June he suffered from slight fever for ten days, but his temperature never exceeded 101·4° F. I had his weight recorded weekly from July 1, when he turned the scale at 980 lb., and he gradually increased to 1,068 lb. at the end of September; but a horse of his size should have weighed 100 lb. more than that. His temperature was taken daily during this period—July to end of September—and registered normal. I had him broken to harness and given slow work and special care, but he refused to thrive.

On October 5 I got a message in the early morning to say that he had been working quietly in a cart and had suddenly become unable to move; it was thought he had dislocated his shoulder. I arrived on the scene about half an hour after the occurrence, when the horse seemed all right, with the exception that he was soaked in perspiration, and I removed him to the Veterinary Hospital.

The line overseer reported to me when the horse was admitted that he had noticed this horse's "guts rumbled a lot," so much so that the native coachman who used to exercise him had called his attention to the noise on several occasions.

The horse after being admitted to hospital was carefully watched, though the reported increased peristalsis of his intestines was not noticed till three days before his death. His temperature from October 5 to 27 remained normal, pulse and respiration also normal, and he was simply kept under observation and carefully fed.

In spite of this he lost condition, and on October 27 his temperature rose to 102·6° F., and remained about 103° F. till he died on November 12 (chart attached). After a few days' per-

sistently raised temperature, and taking into consideration his condition, &c., I suspected one of three things (1) piroplasmosis; (2) internal abscess; (3) glanders (unlikely).

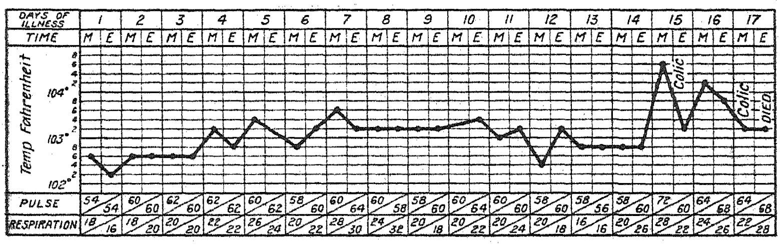
As regards (1) piroplasmosis, microscopical examination failed to show the presence of piroplasms, so I wrote for some mallein to settle the possibility of glanders, but did not receive it before the animal's death.

On November 10 the horse at 5 p.m. had an attack of colic, which yielded to ordinary treatment; marked peristalsis of the bowels was noticed.

On November 12, 6 p.m., colic recurred, accompanied by severe diarrhœa, and the horse died at 5 p.m. next morning.

Unfortunately I was away on purchasing duty the night he died, and also next day, so can only quote the Head Veterinary Assistant's report of *post-mortem* examination, which was as follows:—

Post-mortem Examination.—Large abscess joining stomach to spleen. Estimated to contain over one quart of pus. This abscess had burst into abdominal cavity; no peritonitis. Large



number of small abscesses on diaphragm; mesenteric edge of large colon contained three large abscesses. Internal lining of intestine normal. Liver weighed 25 lb.

Remarks.—This case appears to me to be unusual in several ways. The subject must have been affected for many months; at least I am of opinion his failure to thrive and come on was due to this, but until seventeen days before his death his temperature was normal. In other cases I have had, a persistent high temperature for weeks or even months has been the rule, and is, in my opinion, the chief aid to diagnosis of this condition. This horse would probably have survived some time longer if he had not had an attack of colic. The liver, which I saw myself,

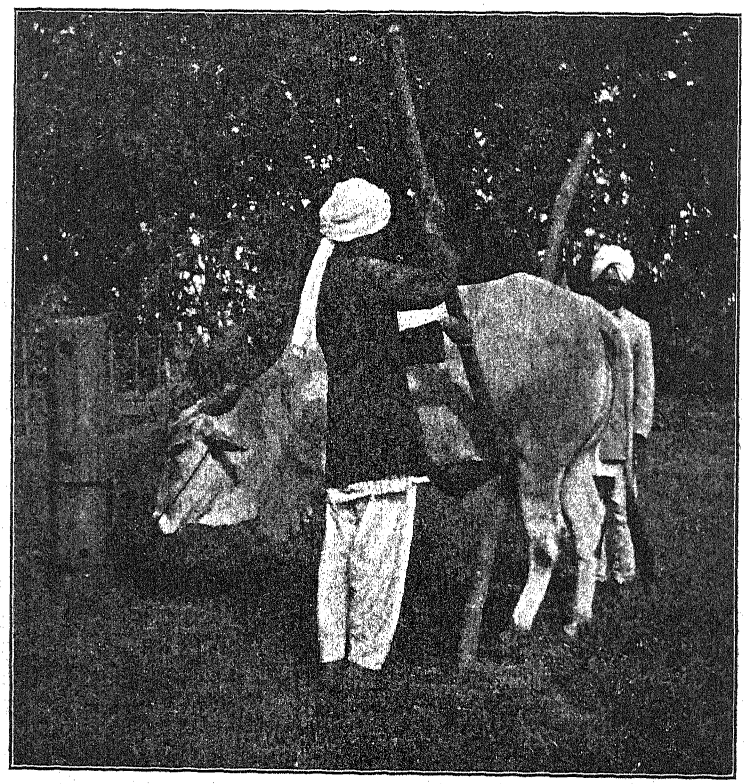
weighed 25 lb., and was macroscopically healthy otherwise; in a horse of this size its normal weight would be about 11 lb. or 12 lb. The marked abnormal peristalsis of the bowels must have been connected with the disease, but I have never remarked it in other similar ones.

AN INDIAN METHOD OF RESTRAINT FOR CATTLE.

By Captain E. S. GILLETT, M.R.C.V.S.,

Army Veterinary Corps, India.

The attached photograph explains a very simple way of restraining cattle. Personally I had never seen it till I çame to Southern India, but it may be, of course, known at home.



All that is required is two ordinary poles, which are crossed under the animal's belly in front of the hind legs, and easily held in position by two men.

It is quick, simple, and effective, and I have found it invaluable when inoculating large numbers of cattle against rinderpest, as even the wildest of cattle can be done without casting them, provided their heads are attached by a strong rope to any stable object.

THE USE OF ADRENALIN IN THE TREATMENT OF ACUTE LAMINITIS.

By Captain T. A. NICHOLAS, M.R.C.V.S.,
Army Veterinary Corps, Norwich.

During the recent army manœuvres there were two cases of acute laminitis among the horses of the 16th (The Queen's) Lancers.

Case 1.—A 47 was noticed at evening stables on August 30, 1910, to be off feed, dull. Temperature, 102°. Fore legs well forward and resting on heels, feet very hot, and throbbing of the digital vessels; groaning on being moved; quivering of muscles of fore limbs.

The hair was removed on each side of both fore pasterns (lower third), and skin painted over with iodized chloroform. Two tablets of adrenalin* (Parke, Davis and Co.) were dissolved in 2 dr. of boiled water. Thirty mimims were injected subcutaneously into each side of both fore pasterns, and cold bran poultices applied to the feet. Next day the horse, although still lame, was able to walk to the Field Veterinary Hospital (300 yards), and as far as I know no further injections were employed and the horse was discharged cured on September 12, 1910.

Case 2.—A 92 was discovered at evening stables on August 31, 1910, after a long march, to be off feed, dull, and showing symptoms of acute laminitis. Temperature, 102·4° F. The same treatment was adopted as in case No. 1, and horse was able to march well to camp on September 3, 1910, a distance of about 10 miles, and was discharged cured on September 4, 1910.

Note.—Both these horses marched back to Norwich from Salisbury Plain. Adrenalin should certainly be tried on all cases of acute laminitis.

* Each tablet contains 0·001 gramme adrenalin. One tablet dissolved in 1 c.c. of distilled water equals 1 000.

HERNIOTOMY IN A VALUABLE RUSSIAN HORSE.

By A. CHINNIAH, G.B.V.C.
Colombo, Ceylon.

History.—On the 20th May, 1909, I was informed by a telephone message that the horse "Lally," belonging to Mr. D. E. W. Pedris, the plumbago merchant, was suffering from an attack of colic. I proceeded to the spot at about two in the morning. As soon as I saw the animal I suspected the colic was due to hernia. I examined the animal per rectum, reduced the hernia and came away after suggesting to the owner that he was suffering from scrotal hernia and that he should be operated upon at no distant date. People of this country dread the word "operation" and I could not induce the man to have the operation done. After this I had an eye on the animal and made frequent enquiries as to his ailments, etc. He had several attacks of colic and they were treated accordingly, as per ordinary colic, by different people. Some time in December, 1909, the scrotum had assumed an enormous size and some practitioner suspecting the tumour to be due to hydrocele applied the strong tincture of iodine, and even the red iodide of mercury blister was put on. And as a result there was a certain amount of sloughing, leaving an ugly sore. Early in January, 1910, it was thrown down by a surgeon and operated upon. When the sore was opened, the gut protruded, and it was put back and stitched up immediately. In June, 1910, the owner brought the horse back to me and an operation was decided upon and performed successfully on the 3rd of July.

The delay till the 3rd of July was due to the want of hernia clam, which had to be made by Messrs. Walker, Sons & Co., Colombo, at my suggestion.

Preparation for the Operation.—From the 1st of July the horse was given bran mashes. On the second morning he was injected with a dose of antitetanic serum and in the evening too the dose was repeated.

Operation.—The instruments taken for the operation were:—scalpels, castration knife, sharp-pointed and blunt bistoury, director, Syme's artery forceps, curved needles, metal castration clam (made by me), and sharp and blunt scissors.

They were thoroughly boiled and sterilized for half an hour before the operation. The animal was thrown on the near side and general anæsthesia (chloroform) was administered. He consumed about eight ounces of chloroform and had to be kept under it for over two

hours. The penis was pulled out, washed and lubricated. The hernia was on the off side, and consequently, the off hind leg was liberated from the hobbles and held firmly by a strong syce. I took my usual position as in castration. The scrotum, as the result of continued meddling and futile blisters, was of a very large size and hence, unwieldy. The presence of excessive adhesions made me take great precautions, bit by bit was carved out carefully in a line parallel to the median raphe, instead of a bold, long, deep cut along it. This was rather a hard task. Till the tunica vaginalis was reached the structures had to be torn by the fingers. When the sac was reached a portion of the serous sac was carefully cut by the scissors, care being taken not to injure the hernia. There was a copious flow of serum. I did not use the director, but with the help of the finger I guided the bistoury in opening the sac and finally the gut was exposed. It being a very chronic case the adhesions gave me some amount of trouble. These being freed the gut was washed in a solution of boracic acid and returned into the abdomen. I have watched several cases of herniotomy in man, done by my friends at the General Hospital, and so I thought I should slit up the funicular portion of the scrotum as far as it was possible and put in a suture or two at the neck. There was some amount of bleeding, but the use of artery forceps had the desired effect. This slit in the scrotal sac enabled me to reach the inguinal ring with ease. With my two left fingers inside the abdomen I pulled one side of the ring up to the edge of the wound I made. Then the needle was passed from the right to the left and I was only able to put one suture with strong catgut. This done I thought I would try to preserve the ornaments of the poor beast, but I had to decide otherwise owing to the big slashing wounds due to the large extent of the adhesions. The slit along the funicular portion of the sac was sutured with continued sutures of strong silk cord.

Having decided not to adopt the conservative process of retaining the testicles, I then hurriedly opened the left sac, and felt the ring and found it free. The whole scrotum with the testicles were enclamped in my metal clam, and I screwed up the bolts very tight. I had to take a further precaution of putting a strong double suture, just above the clam, to prevent the descent of the gut in case the clam came off prematurely. Soon after washing the parts with mercury lotion the animal was on his fours none the worse for the long and tedious operation.

After Treatment.—In the Tropics, where the chances of quick

healing are less, I had to take a deal of trouble over the case. The animal was in a great agony for about four hours till the mortification of the enclamped scrotum and testicles had set in. I always adopt lotion treatment. A spray of carbolic lotion was kept on every now and then for several days. On the third day the scrotum and testicles were cut away about 3 in. below the clam. The clam dropped down on the eighth day, thus exposing a big cavity, which gradually filled up by granulation. The following dressing was applied :—

℞.	Acidi borici	...	℥i
	Iodoformi	...	℥ss
	Ol. eucalypti		
	Acidi carbolici	āā	ʒii
	Glycerini	...	℥xii
	Misce.		

The animal was fit to be driven on August 8. He is now, I am pleased to say, in fine working order.

PRIMARY TUBERCULOSIS OF THE VULVA IN A COW.

By E. JOEST.

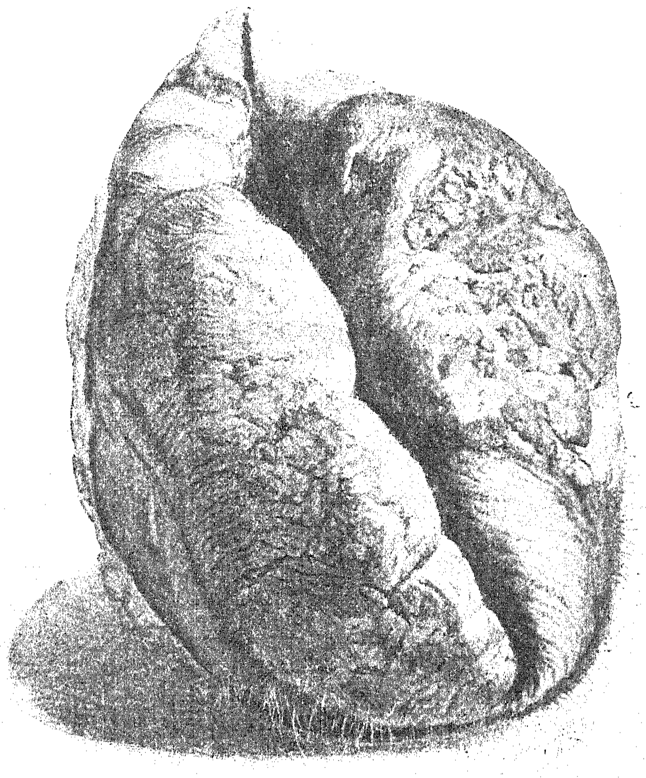
[*From the Report of the Veterinary College of Dresden for* 1909.]

The Pathological Institute received from Dr. Meyer in Weimar, the vulva with the posterior portion of the vagina of a slaughtered cow. The following history was sent: An 8-year old well-nourished cow had given birth to a calf five and a half months previously. Parturition had been effected by a quack who had caused a rent in the vagina. As a result of this injury thickening of the vulva gradually arose. At the *post-mortem*, besides the vulval disease the cow only showed tuberculosis of the bronchial lymphatic glands, the remaining organs, especially the newly-examined uterus, were quite free from tuberculous changes.

Pathological examination showed great thickening of the vulval lips, especially in their transverse diameter. They were swollen to the size of a man's head and their pressure had caused a prolapse of the uterus. The weight of the vulva with the posterior portion of the vagina was 2½ kilogrammes (5¾ lb.). The consistency was hard. The diameter of the right lip was 8 cm. and of the left 6 cm. The clitoris was pushed out of position and was 8 cm. in front of the

ventral angle of the vulva. The cut surface of the thickened vulval lips was greyish yellow in colour, there were caseo-purulent masses in it, and greyish-white connective tissue strands. The tuberculous masses were between the muscle and connective tissue bundles.

Bacteriological examination showed tubercle bacilli. Experimental animals (guinea-pigs) showed tuberculous illness after two to three



weeks, and were killed at the end of six weeks and found to be badly affected with generalized tuberculosis.

In this case the tuberculosis was primary, for on *post-mortem* examination, except for the bronchial glands, the cow showed no internal changes and the uterus especially was normal. The infection probably occurred through the injury occasioned five and a half months previously.

Canine Clinical Notes.

THE TREATMENT OF ECZEMA BY INTRAMUSCULAR INJECTIONS OF A SOLUTION OF COLLARGOL.

By J. A. N. DA CUNHA, G.B.V.C.,
Veterinary Officer to the Government of H.H. the Sultan of Zanzibar.

Subject.—Terrier dog "Slippers," the pet of an army officer's wife.

Symptoms.—Small, irregular eruptic patches excessively sore and tender, covered with encrustations and matting of hairs scattered about the neck, shoulders, dorsal column, and hind quarters, and a few pustules varying in size from a millet seed to a pea under the elbows, belly and inner surface of hind limbs. Great irritability of the skin and intolerable itching, which caused the animal to rub itself continuously against the ground.

Treatment.—All hair was shaved off, the irritable spots cleaned with soap and warm water, and when these were dried different dressings were well rubbed in to allay itching. The eczematous areas were anointed with boric acid and zinc-oxide ointment. The cause of the disease being dietetic in origin, measures were taken to rectify it by administration of purgatives, general tonics, careful diet and exercise.

A large number of well-known remedies, both internal and external, were severally tried for nearly a month and a half, but every endeavour to cure this disease failed.

Fresh eruptions appeared every day over the neighbouring parts, the usual scratching continued and the disease assumed a form of a very annoying character, with strong tendency to recurrence.

The writer's attention was attracted to the method of treating eczema in dogs by collargol, as recorded by Mr. E. Pignet in a veterinary periodical, and his line of treatment was tried as follows:—

Intramuscular injections of 3 c.c. of 1 per cent. solution of collargol every alternate day into the muscles of the thighs, and an external application of the same solution to the sores. On the ninth day the itching irritation subsided, and in another ten days every vestige of this troublesome disease had nearly gone. A slight lameness ensued after each injection, but in every case it disappeared in twenty-four hours.

Subsequently the writer had the opportunity of trying this drug on another similar case of acute moist eczema, with equally successful results and in a shorter space of time.

Argentum colloidale—Colloidal silver—Collargol "is prepared by mixing sulphate of iron and silver nitrate. It occurs in the form of small black, metallic-looking grains, odourless, soluble in water, 1-25 forming a brownish-black solution, and has no caustic action."

The action of collargol is not antibacterial but antitoxic, and this action is supposed to be due to artificial catalyses. It is chiefly used in the form of intravenous injections or intramuscular in the case of small animals, in the doses of 2 to 5 c.c.

THE USE OF ASPIRIN IN CANINE PRACTICE.

By Captain E. S. GILLETT, M.R.C.V.S.,

Army Veterinary Corps, India.

I have lately tried aspirin in cases of dogs suffering from persistently high temperature with exceedingly satisfactory results. The first case I used it on was a pedigree fox-terrier puppy of my own out of imported parents. He had a temperature of 106° F. for a week, often going over 107° F., and refusing all food.

I tried all the ordinary febrifuges, &c., but without the least effect, and eventually administered aspirin in tabloid form. The effect was marvellous—temperature was at once lowered, and in three days the pup was normal, and eating Benger's food greedily and never looked back again.

I have been equally successful in three or four other cases, and think it is well worth a trial by those who may not have already used it.

The depressant effect so well marked after the exhibition of phenacetin and antipyrin is absent.

Abstracts and Reports.

MILK SUPPLY.[1]

INSTRUCTIONS FOR ENSURING THE SUPPLY OF CLEAN MILK.

To Farmers and other Milk Producers.

The Cows.—The cows should be healthy, and to that end they should be kept in the open air as much as possible. Farmers are advised in their own interest, as well as in that of the public, to buy only cows about the health of which they have no doubt, and to keep cows that may happen to fall ill on their farm isolated from other cows.

The cows must be kept clean. For this purpose plenty of good bedding must be provided and regularly renewed. The stalls and manure-channels must be properly constructed.

The udders and teats of the cows must be cleaned with a clean damp cloth before milking. If the udder is soiled so that it cannot be cleaned in the way mentioned, it should be washed with soap and warm water and carefully dried with a clean cloth.

The milkers should be instructed to examine the cow's udders and teats at every milking to ascertain if there is any unusual lump or swelling present. The best time to make the examination is immediately after milking, when the udder is empty. If anything suspicious is found, the advice of a veterinary surgeon should be obtained at once. When there is obvious disease of the udder or teats, the milk should not be sold or used for human food, until a veterinary surgeon has made an examination and decided whether it is safe so to use it.

The Milker.—The milker must wash his or her hands, using a nail-brush, before milking. Soap, towels, and water must be provided in a convenient place for this purpose. A clean linen smock should be worn while milking; and then only. Persons who are poorly or have sickness at home should have nothing to do with the cows without the sanction of a medical man.

The Cow-shed.—The cow-shed should be so lighted that every part of it is easily visible in the daytime with the doors closed.

The cow-shed should be so ventilated that the air in it will not feel close, or have a disagreeable smell, when the cows are all housed and the doors shut. Cows, like human beings, will not suffer from ample ventilation if it is steadily maintained throughout the whole year.

The manure-pit should be so situated as not to affect the fresh-air supply of the cow-shed, and should be as far as possible from any place where milk is kept or dealt with.

Horses, swine, poultry, or pigeons must not be kept in the cow-shed, or in any loft over it, or in any building communicating with it.

[1] Leaflet A prepared by the Joint Committee on Milk of the National Health Society and the National League for Physical Education and Improvement; and published by the League at 4, Tavistock Square, W.C.

Leaflet B contains instructions to Distributors and Retailers of Milk and Leaflet C to Housewives and all Consumers of Milk.

Price: 6d. per doz.; 2s. per hundred; 17s. 6d. per thousand.

The cow-shed must be kept as clean as possible, and have an impervious floor. The ceilings and under surface of the roofs should be cleared of dust and cobwebs at least every three months, and the walls and ceilings lime-washed every six months, and more frequently if necessary. The manure should be taken out not less frequently than twice a day, and the manure-channel and walls should be flushed with water daily at least.

Hay or other food must not be stored in the cow-shed. If hay or other food is stored in a loft over the cow-shed, the trap-doors or other communications with the cow-shed must be kept closed except during the feeding or foddering of the cows.

Every effort should be made to keep the cowshed free from dust, especially at milking times. Foddering or sweeping which creates dust should not be done just before or during milking time.

The milk should not be left standing in the cow-shed, but immediately after each cow is milked her milk should be removed to a suitable place used solely for milk purposes, free from dust or other sources of contamination, and at once strained and cooled.

Utensils.—All milk vessels should be so constructed that all parts can be thoroughly cleaned; they should be without recesses that are difficult to clean.

Milk cans should be so constructed that every part inside is easily cleaned; and when the lid is removed no dust or water falls into the can. Lids must be close-fitting and dust-proof; they should be sealed or locked in transit.

Every milk vessel must have a mouth wide enough to admit the hand, and should after each use be thoroughly cleaned with a wet cloth and rinsed out, and finally scalded with boiling water.

All cloths used for cleaning milk vessels should be frequently wrung out of clean water and should be boiled once daily.

The milk utensils should not be allowed to come into contact with any source of contamination, either when being cleansed or at any other time, and must only be used for milk. For example, milking pails must not be used for watering the cows, and milk utensils must not be washed along with clothes.

It is necessary to have separate accommodation for washing milk utensils, and a separate place for storing them.

An efficient sieve must be provided for straining the milk, and must be maintained in good condition. Muslin or other suitable material must be used with the sieve. The muslin should be washed and scalded immediately after use.

An efficient refrigerator or other means of cooling milk is recommended, as cooling is the best means of keeping milk. The cooling should be carried out in a place which is free from dust or other sources of contamination, and the water used in the refrigerator should be pure.

The refrigerator and the sieve must be treated in a manner similar to the milk vessels, and kept thoroughly clean.

Nothing should be added to the milk for preservative or any other purpose.

Storage.—The place where the milk is stored or sold should be used for no other purpose. It should not communicate directly with the living rooms, and should be adequately ventilated and lighted.

Ventilating openings should be guarded with gauze metal screens to prevent entrance of flies. The milk should be distributed with as little delay as possible.

Human Infection.—Every effort should be made to keep the operations in connection with the milk business separate from household work, so that if infectious disease attacks the family the infection may be kept away from the milk. As children may suffer from unrecognized forms of infectious disease, no young children should be allowed to enter the place where the milk is stored, or take any part in handling the milk or milk utensils.

To be hung up in every Cow-shed.

CHIEF SOURCES OF CONTAMINATION OF MILK AND MEANS OF AVOIDING THEM.

SOURCE OF CONTAMINATION.	REMEDY.
Cow—Dirty udder	Wash udder before milking.
Diseased udder	Do not use the milk. Send for veterinary surgeon.
Milker—Clothes...	Wear clean overalls.
Hands	Wash hands before milking.
Illness	Those who are poorly, or who have sickness at home should cease milking until sanctioned by medical attendant.
Cowshed—Air and dust	Avoid foddering and sweeping at and before milking. Remove milk from cow-shed as soon as possible.
Utensils—Milk-pails, Cans and Coolers.	Cleanse thoroughly by steam or boiling water.
Storage—	Store only in a clean, cool, and airy place, protected from flies and dust.

A METHOD FOR ISOLATING AND GROWING THE LEPRA BACILLUS OF MAN AND THE BACILLUS OF JOHNE'S DISEASE IN CATTLE. (PRELIMINARY NOTE.)

By F. W. TWORT, M.D.,

The Brown Institution, University of London.

FOR a number of years different investigators have attempted to cultivate the lepra bacillus of man and the allied organisms found in the rat and other animals. It is not intended in this preliminary note to discuss the numerous papers which have been published from time to time from the various English, Continental, and American laboratories. These papers deal with non acid-fast bacilli, or with acid-fast bacilli growing quickly on ordinary media, which, in the opinion of the writer, are contami-

nating organisms, and not the true lepra bacillus. So far, no one has produced a culture of acid-fast bacilli isolated from a leper, and showing the characters of the lepra bacillus as found in the tissues of man. It was with the object of obtaining a pure living culture of the lepra bacillus that these investigations were undertaken.

The material used was the nasal discharge and scrapings from a typical leper. The discharge showed large masses of lepra bacilli and a number of contaminating micro-organisms. Firstly, most of the contaminations were killed by placing the discharge in a 2 per cent. solution of ericolin at 38° C. for one hour as recommended for the isolation of the tubercle bacillus*; then cultures were made from the sediment on to different media and incubated at 38° C.†

All the ordinary laboratory media, including Dorset's egg medium, gave negative results. A number of special media containing extracts of fresh gland and other tissues were tested next, the extracts being freed from any contaminating micro-organisms by passing them through a Doulton white filter; these also gave negative results.

In view of the close relationship between the tubercle bacillus and the lepra bacillus, it appeared highly probably that these two organisms would require the same chemical substances for building up their protoplasm, which could be elaborated from the ordinary media only by the tubercle bacillus. It was thought that if these substances could be supplied, already formed, to the lepra bacillus, it might grow, and the easiest method of supplying these substances would be by adding to some good medium the ground-up bodies of tubercle bacilli containing them. Accordingly, a number of tubercle cultures were taken and inoculated on to Dorset's egg medium; when sufficiently grown the tubes were steamed and the growth of tubercle scraped off the surface, care being taken to avoid the medium containing the waste products of the tubercle growth. The tubercle bacilli so obtained were ground up with glycerine and saline, steamed for half an hour and added to the yolk and white of new-laid eggs in the following proportions:—

Eggs, 75 parts; 8 per cent. sodium chloride, 25 parts; mix well and add tubercle bacilli, 1 per cent.; and glycerine, 5 per cent., or less.

The medium was placed in test-tubes, heated to 60° C. for one hour, and on the following morning incubated at 38° C. for six hours, and again heated in water bath at 60° C. for one hour, and set in slopes at 85° C.

The ericolinized nasal discharge of a leper was inoculated on to this medium,‡ the inoculated tubes being capped with gutta-

* Twort, *Proc. Roy. Soc.*, B., 1909, vol. 81.

† Subsequent experiments have shown that 37° is a better temperature (November 19, 1910).

‡ After inoculating the medium with lepra material fresh human blood should be pipetted over the surface.—F.W.T.

percha tissue and incubated at 38° C. After 24 hours the medium absorbed a quantity of the ericolin, so the material was lifted off with a platinum loop and rubbed over fresh tubes. The bacilli grew and were sub-cultured in pure growth, the bacilli growing in sub-cultures as fairly long thin beaded rods; the bacilli were well formed and quite acid-fast. The lepra bacillus inoculated on to this medium at first grows extremely slowly, but later growth becomes faster, marked microscopic evidence being obtained in about four weeks. To the naked eye, growth is only just visible after about six weeks, appearing as a colourless film along the needle track. Attempts to sub-culture on to ordinary laboratory media are always negative.

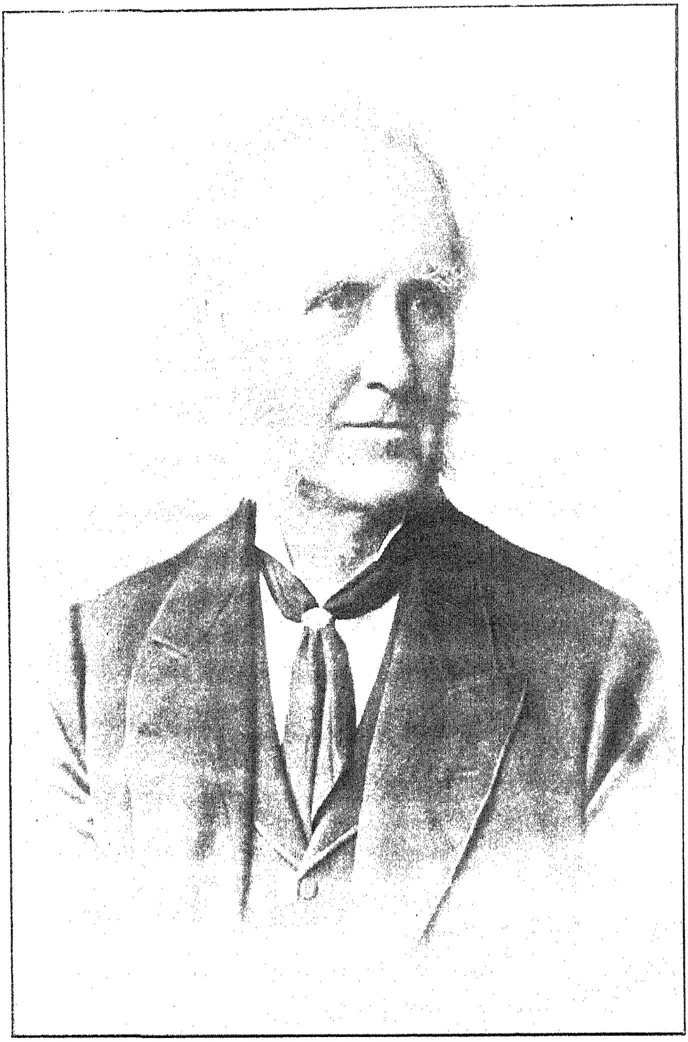
Experiments are now being carried out, using other organisms than the tubercle bacillus for making the medium; and also testing various micro-organisms on the medium.

In the near future it is hoped to prepare a vaccine from the ground-up lepra bacilli, for the treatment of man suffering from leprosy. An attempt to grow the rat lepra bacillus on the same medium will also be made if the material can be obtained.

In conclusion, I may note that, working with Mr. Ingram, M.R.C.V.S., on the same medium I have also succeeded in isolating and growing the acid-fast bacillus found in the intestine of cows in Jöhne's disease. The first generation of this bacillus grows often long, with occasional branching and club formation, in sub-cultures it gradually grows smaller, and in the second or third generation is about the size of the tubercle bacillus. The growth is only just visible to the naked eye, and sub-cultures on the ordinary laboratory media show no evidence of multiplication. Jöhne's bacillus grows somewhat more easily than Hansen's lepra bacillus, the bacilli being well formed and quite acid-fast. The cultures were incubated at 40° C. It is hoped, when sufficient material is obtained, to prepare a vaccine for diagnostic purposes.

Further details of these experiments will be published later.

(*Proceedings of the Royal Society*, B., vol. 83.)



DR. HENRY POWER.

Late Professor of Physiology at the Royal Veterinary College, London.

HENRY POWER, 1829—1911.

Born at Nantes, in France, September 3, 1829, only child of Captain John Francis Power, 35th Regiment, by his second wife, Hannah, daughter of Henry Simpson, of Meadowfield, Whitby, Yorkshire. Immediately after his birth Henry Power was taken to Barbados, where his father was quartered, and narrowly escaped death in the great hurricane which devastated the island on August 11, 1831. Major Power resigned his commission in 1833, and for many years spent a wandering life, during which his son was sent to many different schools, amongst others to Cheltenham College. He was apprenticed to Mr. Thomas Lowe Wheeler in 1844, and entered at St. Bartholomew's Hospital. Botany attracted him especially, and he was awarded the Linnæan and the Galen medals at the Society of Apothecaries. In 1851 he was admitted a Licentiate of the Society of Apothecaries and a Member of the Royal College of Surgeons of England, and on December 1, 1854, he was elected a Fellow of the Royal College of Surgeons. At the University of London he had a brilliant career. He took the prize for chemistry at the matriculation; the exhibition and gold medal in anatomy and physiology and the gold medal in structural and physiological botany at the intermediate examination in medicine in 1852; the scholarship and gold medal in physiology and comparative anatomy, and the scholarship and gold medal in surgery at the final M.B. examination, graduating M.B. in 1855.

In 1851 Mr. Power was appointed Demonstrator of Anatomy at the Westminster Hospital, where he was afterwards appointed assistant surgeon. In 1855 he became assistant surgeon at the Royal Westminster Ophthalmic Hospital, and ten years later he was elected ophthalmic surgeon at St. George's Hospital, a position he resigned in 1870, when the department for diseases of the eye was instituted at St. Bartholomew's Hospital, and he was chosen the first ophthalmic surgeon.

He filled the office of Professor of Physiology at the Royal Veterinary College from 1881-1904, and on his retirement he was much touched by the presentation from the members of his class of an arm-chair fitted with an electric reading lamp and furnished with an appropriate inscription, as well as by a separate presentation from veterinary surgeons—former pupils—in South Africa who had been too late in contributing to the original testimonial.

At the Royal College of Surgeons of England he filled nearly all the official positions. He was a member of the Board of Examiners in Anatomy and Physiology from 1875-1884; and in physiology only from 1884-1886, when his place was taken by his eldest son, Mr. D'Arcy Power. He served two terms of office as a member of the Council from 1879-1890, and was a vice-president for the year 1885. He delivered the Arris and Gale lectures on anatomy and physiology, 1882-83; was Hunterian Professor of Surgery and Pathology, 1885-1887; Bradshaw Lecturer in 1886, and Hunterian Orator in 1889. At the University of Oxford he was an examiner in the School of Natural Science; at Cambridge

he was an examiner in the Natural Science Tripos; he examined at the University of Durham, and at the University of London he was an examiner in Physiology.

He served the office of president of the Harveian Society of London for a double term of office, 1880-81. He was president of the Ophthalmological Society of the United Kingdom, 1890-93, and was a vice-president of the Royal Medical and Chirurgical Society, 1892-93. For many years he was surgeon to the Linen and Woollen Drapers' Benevolent Fund and to the Artists' Fund.

He married his first cousin, Ann, daughter of Thomas Simpson, Esq., of Meadowfield, Whitby, Yorkshire, on December 21, 1854, by whom he had a numerous family, of whom four sons and four daughters survive.

The death of Sir William Savory, his lifelong friend and companion, in 1895; of Mr. Bowater J. Vernon, his colleague in the eye wards, with whom he was in daily communication in 1901; and finally the tragedy which drowned his artist daughter and his granddaughter before his eyes at Whitby, when he was himself rescued with difficulty, so saddened him that he decided to leave London for a less exacting life in more congenial surroundings.

Mr. Power was a skilful artist both in watercolours and with a brush and Indian ink, and in early life he played the violin.

He was interred at Whitby on Saturday, January 21, amid many tokens of respect from his fellow-townsmen and with a wealth of flowers sent from all parts by his numerous friends.

He wrote (1) "Illustrations of the Principal Diseases of the Eye," the original watercolour drawings being made by himself from patients who came under his care at the Royal Westminster Ophthalmic Hospital. (2) "A Text-book of Human Physiology" (Messrs. Cassell). (3) "Articles for Professor Axe's Monograph on the Horse.". (4) "The New Sydenham Society's Lexicon of Medical Terms" (with Dr. Leonard W. Sedgewick). (5) "Translations from the German of Stricker's Manual of Human and Comparative Histology," in 3 vols.; "Kramer on the Aural Surgery of the Present Day"; "Erb on Diseases of the Peripheral Cerebrospinal Nerves."

Reviews.

SPEZIELLE PATHOLOGIE UND THERAPIE DER HAUSTIERE. By Hutyra and Marek. (Special Pathology and Therapy of the Domesticated Animals.)

IT is hardly two years ago since a second edition of this work was published and reviewed in the pages of this journal. A third edition is now on the market, showing that the volumes have been eagerly taken up and used by the reading professional public. In order to keep pace with advancing scientific knowledge in connection with the conferring of immunity and diagnosis of disease by means of sera reactions, a third edition was necessary, and these new methods of investigation obtain full consideration in the present volumes.

Tuberculosis, glanders, contagious abortion and swine fever all receive amplified review. Tropical illnesses also have more extended notice. Fresh chapters have been added on the leucæmia of hens, dochmiasis or "salt sickness" in cattle (Southern Texas, Florida, and Bohemia), enzootic cretinism in animals, serum illness and necrobacillosis. Up-to-date information on Jöhne's disease is given, but it is questionable whether English investigators will agree with the names "spezifische paratuberkulöse Därmentzundung der Rinder" or "enteritis paratuberculosis bovis specifica" used. It is rather strange and surely an error—or is it a posthumous joke?—that the only synonym for the disease, viz., "Jöhne's disease," is given as an English one, and an English one only. We fancy that the disease would be known and recognized by this name in many other countries besides England, seeing that it has been noticed in Germany, Denmark, Holland, France, Norway, Switzerland, Hungary, and North America. There is an excellent illustration of the disease.

Descriptions are given of the palisade and red worms which were recently the subject of some controversy.

Our most up-to-date investigators will not consider the nomenclature as satisfactory. The names given are: (1) *Sclerostonum equinum*; (2) *Sclerostonum vulgare*; (3) *Sclerostonum edentatum*; (4)*Cyathostonum tetracanthum*. Perhaps of more importance than the nomenclature is the treatment adopted against these worms on the Continent, which consists of subcutaneous and intravenous injections of atoxyl (natrium arsenicosum) in gradually ascending doses. Intensive nourishment of the suffering subjects is also advised.

Hodgkins' disease is described as a pseudoleukæmia, but the picture of the dog given on page 870 as suffering from lymphatic leukæmia looks very like a clinical illustration of Hodgkins' disease. Several good coloured plates have been added to the work, notably those of contagious vaginitis, the ophthalmo reactions in glanders and tuberculosis, and pustulous acariasis in the dog. The chapters on skin diseases are a strong feature of the book and well worthy of the perusal of all veterinarians; even a glance at the illustrations being educative if one cannot understand the text.

Notwithstanding the additions and alterations in the volumes the compass of the tomes is not greatly increased. The spelling of the word "rachitis" is still original, and with close proof reading ought to have been corrected.

Nothing but praise can be given to the authors of the book, and their industry and facilities for acquiring thorough information must have been great. Finally it may be written that the book is destined to last and be of great and valuable service to veterinary surgeons and medical men; it is published in two volumes by the firm of Gustav Fischer, of Jena; the literature overhauled for the compilation of the text dates, with few exceptions, right up to the end of May, 1910. The work has already been translated into Italian, and Russian editions are in process of publication.—G. M.

THE JOURNAL OF MEAT AND MILK HYGIENE. Bale, Sons and Danielsson, Ltd., London. No. 1, Vol. I., January, 1911, pp. 64. 1s. net post free.

WE have received from the publishers a copy of a new public health journal, which should prove of interest to veterinary surgeons occupied in the practice of Municipal or State Veterinary Medicine. If succeeding numbers come up to the standard of number one there can be little doubt but that the journal has come to stay. We notice among the contents of the issue before us an article on "Meat Poisoning" from the pen of Professor E. J. McWeeney, Examiner to the Royal College; an article by Dr. Hume Patterson, Bacteriologist of the County of Lanark, and a contribution from Dr. Dittmar, the Scottish Local Government Board Medical Inspector, on "The Public Slaughterhouse System of Scotland." Editorially the Tuberculosis Order is discussed, also the subject of a Uniform System of Meat Inspection. Veterinary contributions also appear, and these are from the pens of Mr. A. M. Trotter, of Glasgow, and Mr. Thomas Parker, of Newcastle-on-Tyne. One more article should be mentioned, though it by no means completes the list, and that is an article on "Edinburgh Slaughterhouses," which is illustrated by photographs and a plan. The number of veterinarians employed in public health work is small, but we heartily recommend them to invest a shilling on our new contemporary, and we sincerely wish it every success in bringing about its avowed object of securing for Great Britain and Ireland a satisfactory meat and milk supply.

MERCK'S INDEX. By E. Merck, of Darmstadt. 392 pages, 6s. 6d., post free, from the London office of the firm in Jewry Street.

THIS work contains a short *résumé* of most of the medicaments at present used in the medical and veterinary worlds. Arranged in alphabetical order, reference to any therapeutical agent is quickly effected. German, French, English, Italian, &c., preparations figure in the list and make the index quite cosmopolitan in character. The healing agents are divided into three chief parts, comprising (1) preparations; (2) drugs; and (3) minerals. In the drug list we get the etymology, source, family,

common name, country of origin, constituents, and last, but not least, the chief uses of any agent under consideration. The index is very complete and contains up-to-date information in a concise form of almost any and every medicinal article employed by science in combating disease.

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Translations.

A NEW OPINION ON THE ETIOLOGY OF MILK FEVER.

By KREUTZER.

NONE of the causative factors up to to-day is sufficient. The *theory of intoxication* neither explains the good effects of intramammary injections nor the absence of the illness in cows in a poor state. It does not enable us to understand why disinfection of the intestine and repeated milkings are without favourable action on the course of the malady. The *theory of infection* has against it this fact, that the microbes described as pathogenic are normal hosts of the teat or genital passages, and that they have never been able to reproduce milk fever experimentally. Besides, how can one understand the absence of fever and the good effect of insufflation of air?

One can also raise numerous objections against the *theory of circulatory trouble* which puts the symptoms observed to the account of a cerebral anæmia following afflux of blood to the udder. Why are the symptoms produced generally two days after calving? Why are they sometimes observed before calving? Why does the paralysis spread slowly to the posterior limbs, then to the anterior and then to the neck? Why are bad milkers exempt? Why are medicines that modify the circulation without action?

According to the author, everything may be explained when one considers the circulatory disturbance of the lymphatic system and when one seeks in the lymphatic system of the udder the point of departure of the malady. At the moment when lactation establishes itself, the lymphatic circulation becomes very active and a large quantity of lymph is diverted into the afferent vessels, into the sub-lumbar glands, and gradually into the cistern of Pecquet. This rapid flow of lymph provokes an increase of pressure which makes itself felt as it mounts in all the affluent lymphatics and provokes at the level of their roots of origin modifications in the conformity and conductibility of the nerves. Thus is explained the successive appearance of

Notwithstanding the additions and alterations in the volumes the compass of the tomes is not greatly increased. The spelling of the word "rachitis" is still original, and with close proof reading ought to have been corrected.

Nothing but praise can be given to the authors of the book, and their industry and facilities for acquiring thorough information must have been great. Finally it may be written that the book is destined to last and be of great and valuable service to veterinary surgeons and medical men; it is published in two volumes by the firm of Gustav Fischer, of Jena; the literature overhauled for the compilation of the text dates, with few exceptions, right up to the end of May, 1910. The work has already been translated into Italian, and Russian editions are in process of publication.—G. M.

THE JOURNAL OF MEAT AND MILK HYGIENE. Bale, Sons and Danielsson, Ltd., London. No. 1, Vol. I., January, 1911, pp. 64. 1s. net post free.

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digestive troubles by modifications of the nervous terminations of the sympathetic and of the gastric and mesenteric plexus, of paralysis of the posterior members (lymphatic stasis in the posterior marrow), paralysis of the anterior members, then of the neck, and finally brain symptoms; "naturally a weak pressure only suffices to provoke functional disturbance of the brain and cord." Weakness of the heart will be a result of paralysis of the vagus. The absence of inflammatory reaction, the progressive paralysis will explain the lowness of the temperature. The snoring noise will be due to compression of the recurrent by the lymphatic trunks of the neck. Finally, this hypothesis enables us to understand the origin of serous collections found at the autopsy in fatal cases (lymphatic stasis). If the cow is the only domesticated female affected with milk fever it is because the has an udder much more functionally active than that of others and it is precisely in the best milkers that the malady occurs; rapid and abundant secretion accompany each other; in fact, a sudden and intense lymphatic flux which causes the symptoms observed. The frequency of the illness after the third calving is because in the cow lactation attains its maximum at this time. The evolution of milk fever before or a long time after calving is caused by sudden variations of the secretion; indigestion, for example, leads to a great diminution of milk, followed by an increase when cure occurs. If the injection of air under strong pressure effects immediate cure it is because it suspends all lymphatic circulation in the udder which permits the general circulation to take up its normal course.

(*Münchener tierärztliche Wochenschrift, ex Revue Générale de Médecine Vétérinaire.*)

DOUBLE-SIDED INFLAMMATION OF THE LUNGS IN A HORSE THROUGH BREATHING SULPHUROUS ACID VAPOUR.

By Dr. HEUSZ.

Staff Veterinary Surgeon.

The rare occurrence of poisoning through breathing sulphurous anhydride in domestic animals seems to justify the recording of the following case. It occurred in the practice of Herr Müther, abattoir director, and I was called in in consultation.

The stall in which the horse was stabled was situated quite close to a cooling establishment in the Pictet system. Contrary to order the fluid in an enclosed vessel was allowed to flow out on the ground. The liberation of the gas in the neighbourhood had the tragi-comic effect of causing violent coughing among the ladies inhabiting a two-storied house close by, the fumes coming up into the house and necessitating hasty and thorough aeration of the rooms. Beyond an airing of the stable near the cooler, nothing was done and nothing suspected. In the morning—about twelve hours after the accident—when the horse was to be fed, it was noticed that the stable was full of a stinking smell. The animal was immediately let out, and on account of need of air and general unrest it was brought under veterinary treatment.

The animal was a brown mare, aged 11, of Belgian strain. Visible mucous membranes reddened. Pulse 60 and easily perceptible. Temperature 40·5° C. Pumping breathing with distended nostrils, respirations 35. On auscultation of the lungs on the under and middle third there was a rattling noise in union with whistling. In the upper third of the right lung sharp vesicular breathing was noticeable. The appetite was gone. The animal was brought into a roomy, airy stall. The thorax was wrapped in blankets wrung out of hot water, and the patient received subcutaneous injections of camphorated oil, and internally electuary of acetate of soda.

On the second day the patient stood apathetically and could only be moved with difficulty. The pulse was imperceptible. On the mucous membrane of the nose there were dark red, sharply defined spots about the size of a 10-pfennig piece. From both nostrils there was a discharge of slimy fluid mixed with blood. Breathing laboured and about 46 per minute. There was severe spontaneous coughing appearing whenever the animal made the slightest movement. Only a little hay was taken, and dung was frequently voided in small balls covered with slime.

On the third and fourth day the position was much the same. The conjunctival membrane showed a watery appearance with a yellow streak.

On the fifth day, temperature 39·8° C., respiration 32. Examination of the urine revealed it to be yellowish brown, turbid and opaque and full of threads. Reaction strongly alkaline. Sp. gr. 1036 and traces of albumin and much mucin.

On the sixth day the state of the lungs showed slight improvement, there being vesicular breathing in most of the right lung area. General condition much the same, but the horse had lain down for the first time.

On the seventh day visible improvement, hay and oats eaten. Nasal discharge more copious, greyish-white and slimy. Pulse 72, breathing 24, with pronounced flank movement.

On the eighth day further progress.

On the ninth day lung sounds almost normal. Cough less and breathing performed without special trouble.

On the eleventh day the horse was put to light work. Ten days later it had only a slight cough and quick breathing when exerted much. These symptoms disappeared a few weeks later.

(*Zeitschrift für Veterinärkunde.*)

THE INSPECTOR'S NOTE-BOOK.

Abridged Techinique.

Hare or Rabbit?—A domestic rabbit is exposed for sale in its skin and not eviscerated with a view of making it pass for a hare. How can one distinguish one from the other? Look at the extremity of the ear, which has a black pouch or pocket in the hare, even in the white hare. This black pocket does not exist in the ear of the rabbit.

Young Rabbit or Warrener?—A domestic rabbit exposed for sale in its skin and not eviscerated will be distinguished from a wild rabbit by

the length of its ears. Take the ears and lay them down forwards; if they do not pass the end of the nose, it is a wild rabbit; if they are longer, it is a young domestic rabbit.

Roebuck or Deer?—Important diagnosis, for the deer may be sold as roebuck; the latter is more valuable than the former. The deer has an eye vein and possesses a long tail, very apparent. The roebuck has no eye vein; its tail is hardly visible.

Head of the Domestic Duck or Head of the Domestic Goose?—Easily differentiated by the following: The nostrils of the duck are situated at the base of the superior mandible; the nostrils of the goose are discernible at an equal distance from the base and the extremity of the mandible. If one pulls away the superior from the inferior mandible, it will be seen that the buccal roof of the duck forms a vault, and that of the goose is flat, with asperities.

In what State of Putrefaction ought we to reject Game which is "very high"?—When the hair or the feathers can be easily pulled out, and when by palpation there is crepitation, denoting putrid emphysema in the muscular tissue.—*L'Hygiène de la Viande et du Lait.*

Letters and Communications, &c.

Captain Gillett; Captain Nicholas; Mr. E. Wallis Hoare; Professor W. L. Williams; Professor Gofton; Professor J. T. Share Jones; Dr. Twort; Dr. Bagshaw; Mr. S. J. Motton; Mr. A. Chinniah; Mr. J. A. N. da Cunha; The Director General Army Veterinary Service, Mr. H. A. Reid; Mr. Jowett; Mr. Bevan; Mr. D'Arcy Power; The Anti-vivisection Society.

Books and Periodicals, &c., Received.

Journal of the Royal Army Medical Corps; Bulletin of the Bureau of Sleeping Sickness; The Representative Board of Agriculture and Fisheries; Department of Agriculture and Technical Instruction for Ireland; Ecyclopædia of Sport (Mr. Heinemann); Agricultural Journal of the Cape of Good Hope; Merck's Index; The Journal of Meat and Milk Hygiene; The Animals' Friend.

NOTE.—All communications should be addressed to 8, Henrietta Street, Covent Garden, London, W.C. Telephone, 4646 Gerrard. Telegrams, "Baillière, London."

Letters for the JOURNAL, literary contributions, reports, notices, books for review, exchanges, new instruments or materials, and all matter for publication (except advertisements) should be addressed to the Editors.

Manuscript—preferably type-written—should be on one side only of paper, marked with full name of author.

Illustrations for reproduction should be in good black or dark brown on white paper or card.

Advertisements and all business matters relating to the JOURNAL should be addressed to the publishers, Messrs. Baillière, Tindall and Cox.

THE

VETERINARY JOURNAL

MARCH, 1911.

Editorial.

THE LITIGIOUS CLIENT.

We have all met him or, more frequently, "her"! for unluckily it is more often than not the client of the female persuasion who most commonly enters the plaintiff box with thoughtless speed. Those who have had most to do with the law let the law severely alone, but a professional man is often, unfortunately, compelled to take proceedings in order to defend his professional honour. Two such cases have occurred within the past month, and in each instance the veterinary surgeon in the case has emerged triumphant and with his reputation unsullied. Full reports have already been given in the daily press and in the columns of our weekly contemporaries, so that one need not do more than briefly refer to them here, but each illustrates very forcibly the value of the National Veterinary Defence Society and the necessity with ourselves for acting up to our motto of "*Vis unita fortior.*" In the one case a young practitioner was sued by a lady who endeavoured to prove that she had caught mange from a dog which he had returned home from his infirmary as cured. She attempted to claim heavy damages in respect to the expenses she had incurred in being treated for a skin affection which she stated she had acquired from the dog, for sundry articles of clothing, &c., which had had to be destroyed, and also for the damage done to two other dogs which she asserted had caught mange from the animal after it had been sent home as cured. As the amount claimed was considerable the case had to be heard in the High Court, and eminent King's Counsel were briefed on either side. When, however, it was stated in cross-examination, in the evidence of her own medical attendant, that the "lady" had "human itch,"

or "scabies," and that the dogs had been previously treated by another well-known veterinary surgeon, off and on for a period of three years, for eczema, there was no alternative for the jury but to decide in favour of the defendant, and the case collapsed.

In the second instance a veterinary surgeon justly sued a client for fees owing for the treatment of a number of dogs, also the subjects of mange, and the client (a lady again) counter-claimed a much greater sum as the value of certain of the dogs who died of distemper whilst in hospital, endeavouring to prove that they had contracted the disease during their stay there, and that it was entirely through the improper, careless, and neglectful treatment of the professional attendant. In this contention she was supported by the officials of a well-known so-called philanthropic society, to whom the animal-loving public leave large legacies and to whom they subscribe enormous sums every year. Why this society interfered and tried to injure the reputation of this particular member of our profession is not quite clear, and why certain methods were adopted to obtain a conviction requires more explanation still. Luckily the evidence which was given was completely "cut up" in cross-examination and only reacted in favour of the side it was intended to crush. In each case the veterinarian had loyal help from his professional brethren (although the opposite side had no apparent difficulty in getting professional witnesses to give evidence, too), and there is no doubt that but for this the case would have "gone hard."

It seems somewhat astonishing upon reading the reports that any professional man could so readily be induced to give evidence against his brother practitioner when so serious a charge was brought, for had not both veterinary surgeons in these actions been men of substance and of good moral courage, the costs of the action alone would have meant something very serious, not to speak of the loss of professional reputation and *clientèle*. Certainly they are to be congratulated on the respective results obtained, and perhaps the latter may be a wholesome lesson to other clients who have desires and tendencies towards vexatious litigation.

It is a thing which every professional man is liable to, and all goes to prove the value of the establishment on a firm basis of a powerful central body with ample funds in hand to assist each of its individual members when occasion requires. The National

Veterinary Defence Society does good work in this direction, but might in many ways perhaps be made stronger, and the whole thing is certainly another point which shows the necessity of a voluntary or compulsory tax in order to place the Corporate Body of the Royal College itself on a safe and sound monetary basis. Should any expensive law case connected with the Royal College itself arise at the present moment, the Council would be powerless to act unless the individual members voluntarily submitted themselves to a tax or gave liberal donations. Our very existence would be threatened, and the sooner the new Bill becomes law the better for our safety.

General Articles.

FRACTURES OF THE HIP BONE.

By A. GOFTON, F.R.C.V.S.
Professor in the Royal Veterinary College, Edinburgh.

FRACTURES of the hip bone are of comparatively common occurrence in equines, probably following in order of frequency those of the tibia and the phalangeal bones. They must always be regarded as serious since they involve the largest bone of the body and one which has an important weight bearing function to perform; nevertheless, the position of the fractured bone, its thick, protective covering of muscles and its extremely small degree of natural mobility are all factors which are favourable to a satisfactory recovery and in few of the simple fractures met with in horses do the conditions lend themselves to treatment with a better prospect of success than in the majority of those of the hip bone. Deformity may and frequently does persist in varying degrees, but the working value of the animals is unimpaired in a considerable percentage of cases. This view may not be accepted without question; it is perhaps opposed to the opinion commonly held on the subject, but experience has shown that there are at least reasonable grounds for holding it.

In horses and cattle the external angle of the ilium is by far the most common site of fracture on account of its prominence and consequent exposure to injury as the result of falls or of rushing past fixed objects. The internal angle is very rarely fractured and the broad flattened portion still less frequently so;

but the shaft of the ilium above the acetabulum is a very common seat. Fracture of the acetabulum is far from uncommon, the line of fracture seldom bearing a relationship to the original lines of union of the ilium, ischium, and pubis. The ischium and pubis may be fractured into the obturator foramen separately or simultaneously, and less frequently they are fractured at the symphysis or close to it. Multiple fractures may be found *post mortem* as the result of severe violence, but sometimes a double fracture is met with in the absence of any history of specific injury.

Most hip fractures are due to violence in the shape of falls, collisions with fixed or moving objects, and crushing, but a proportion are the result of excessive or inco-ordinate muscular action. This is particularly the case with fractures of the ischium and pubis, the history very commonly associated with them and which in many instances does not permit of doubt, being that of sudden and unusually severe lameness during progression without apparent exciting cause other than a foot slipping from one paving-stone to another, or a slight stumble without a fall. Fractures of the shaft of the ilium and of the acetabulum sometimes occur in a similar manner, though doubt has been cast on the possibility of this happening as the result solely of muscular action. It is impossible to regard a fracture in either of these positions as the consequence of direct violence when it follows a slip of a foot on the paved stones of a street, or as has been stated by the owner, a stumble dependant on a knuckling of the fetlock or an apparent partial collapse of the limb. Excessive and probably inco-ordinate contraction of one or more of the powerful muscles attached to the hip bone, in an effort to overcome the effects of the slip or stumble, appears to be the only feasible explanation of the occurrence.

A primary fracture, by weakening the whole skeleton of the hip, may predispose to secondary fracture in other positions, the secondary fracture being commonly the result of excessive muscular action. The risk of secondary fracture is greatest when the pain and lameness associated with the primary one are mild, for animals are then liable to test the resistance of the bone to a greater extent than in its weakened condition it is able to stand.

Fractures through the ischio-pubic symphysis or through the ischium and pubis, near the symphysis, have occurred as a consequence of animals slipping and falling with the limbs "spread-

eagle." This is most liable to happen from pulling up sharply on soft, clayey, slippery ground, or as a consequence of animals throwing themselves about when in a delirious or semi-conscious condition, as sometimes occurs in milk fever in cattle.

The symptoms of fracture of the hip bone vary with its site. They are very pronounced in fracture of the shaft of the ilium and of the acetabulum, and, on the other hand, are often so mild in fracture of the pubis or ischium that they appear to be almost incompatible with such a serious lesion. Lameness is a feature of all fractures of the hip bone, commencing suddenly and being almost invariably severe in its earlier periods. When the shaft of the ilium, or more particularly, the acetabulum, is the site of the lesion, it amounts in many cases to complete inability to support weight on the limb and persists for weeks with a slow but gradual improvement. Multiple fractures exhibit a similar degree of inability. The external angle of the ilium and the tuber ischii, not being weight-supporting, the lameness associated with their fracture is very rarely so pronounced; usually it passes with the subsidence of the inflammatory reaction consequent on the effects of the violence responsible for the accident, though in an occasional case and particularly when the tuber ischii is involved, it may persist in a greatly-modified degree for an indefinite period.

The amount of lameness associated with fracture of the pubis or the ischium is variable. Most commonly it is very pronounced immediately after the accident, but it rapidly diminishes and within an hour or two the animal may be able to walk several miles and in a few days may be walking and trotting sound, even though crepitus may be heard at each step. The comparatively small amount of lameness within a few hours of the accident is such a common feature of these fractures that they are very liable to be overlooked in making an examination as its cause. It is of the highest importance to bear this point in mind, because of the extent to which these fractures reduce the resistance of the sound portions of the bone and the consequent greatly increased liability of the latter to give way if subjected to any unusual strain. Possibly the most common secondary fracture occurring in this manner is that of the shaft of the ilium, the primary one being a fracture of the pubis.

It has not been the experience of the writer to meet with secondary fracture in association with fracture of the ischium, but

in view of what is known to occur as a result of undiagnosed fracture of the pubis and the close similarity between the symptoms of the two conditions, the possibility of this happening is obvious.

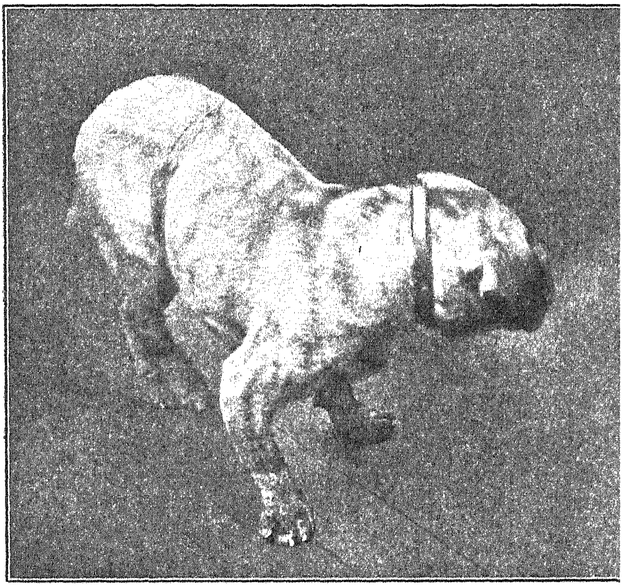
In the more severe lameness associated with hip fracture, horses and cattle may swing the limb and refuse to accept weight on it at all, but usually the foot is placed on the ground a little in advance of the sound one and with just sufficient firmness to ensure its being kept fixed. If forced to move, either no weight is accepted on the limb at all or the movement is practically a hop in order that a minimum of weight shall fall for the shortest possible period of time on the lame limb. There is always a great unwillingness to move and in carrying the leg forward the quarter is elevated and the limb advanced in a manner which reduces as much as possible movement of the hip joint. The foot is brought to rest a very short distance in front of the sound one.

When less pronounced it is seldom that the lameness presents characters sufficiently clear to permit of its definite location in the hip without the aid of local symptoms, but certain features may be observed which should lead to a careful and detailed examination of this region. The most noticeable are, that the forward portion of the stride is restricted, the foot being placed on the ground a short distance in advance of the sound one, the affected quarter is elevated in carrying it forward, the movements of the hind limbs are not in a line with those of the fore, the hindquarters being twisted round to the sound side, resulting in a movement which is difficult to describe except by saying that it presents a three-cornered appearance. Abnormal movements are naturally more accentuated and therefore more noticeable in the trot than in the walk, but they are not constant and none may be observed which attract attention to the hip region.

The position in which the limb is held in fracture of the acetabulum attracts attention as a rule. It is markedly adducted, the foot being placed in front of the sound one and not uncommonly resting upon it. The dog carries the limb in all hip fractures and the position of adduction is very noticeable in acetabulum fracture, the point of the hock of the lame limb being almost directly in front of the sound limb, and the foot not infrequently slightly to the outer side of it, a position, however,

which is common to other acute morbid conditions of the hip joint in the dog.

Fracture through the symphysis or parallel to it causes abduction of the limbs in movement, turning outwards and marked dragging of the toes with difficulty or inability in rising (Williams). Möller states that this fracture sometimes produces very slight disturbance and that the "body-weight is apt to break down the union between the sacrum and the ilium on the other side, or that the inner angle of the ilium may become fractured; the animals are then unable to stand and always die from decubitus."



Photograph illustrating the position of the limb in acetabulum fracture.

Crepitus is occasionally, though very rarely, a demonstrable feature in fracture of the external angle of the ilium. In all other fractures it is a constant symptom, though in the larger animals it is sometimes difficult to demonstrate by manipulation of the bone. When the tuber ischii is involved, forcibly drawing the limb forwards and manipulating the bony prominence may facilitate its detection. It is perhaps most easily demonstrated in fracture of the acetabulum, if the animal be lying, by applying moderate pressure over the great trochanter of the femur and manipulating the limb in a manner which will cause the head of

the femur to move within the cotyloid cavity, but it is necessary to differentiate between true crepitus and the "joint crepitus," which may be found in other morbid conditions of the hip joint and which are not uncommon in the dog. Crepitus will be most readily detected when the animal makes a natural movement of the limb; it is then, as a rule, both readily felt and heard, even though it may have been found impossible previously to demonstrate it on manipulation. Apart from natural movements, grasping the external angle of the ilium and the tuber ischii, and rocking the animal from side to side, affords the best means of detecting it.

A certain measure of displacement always occurs, the degree varying with the site of the fracture. It takes place immediately after fracture of the external angle of the ilium, the detached portion being pulled downwards by the contractions of the tensor fasciae latae, the internal and the external abdominal oblique muscles. The displacement is at a minimum when only a small fragment has been broken off, but usually it is sufficient to make subsequent bony union impossible. The action of the semi-tendinosus, semi-membranosus, and the biceps femoris muscles causes a downward and outward displacement of the tuber ischii when fractured.

In a very large proportion of cases the ilium undergoes obvious displacement, subsequent to a fracture of the shaft, the external angle being pulled downwards. If the fracture has been the result of considerable violence applied to the side of the hip, it may take place as an immediate effect of the force applied, but in simple fracture it is more common to find the displacement effected gradually as a consequence of muscular action and twelve to twenty-four hours may elapse before it is recognizable by external signs. A very similar displacement is associated with fracture of the acetabulum; it usually occurs some hours after the accident, but is invariably much less in degree and the amount of permanent deformity may be very slight. As a general rule, the amount of displacement is small in other simple fractures of the hip bone and there is seldom external evidence of it.

The resulting deformity naturally bears a definite relationship to the amount of displacement. From what has been said already, it is obvious that it will be greatest when a large piece of bone has been fractured off the external angle of the ilium

and that the deformity will consist of a flattening over the side of the quarter producing a noticeable disparity between the two hips. A somewhat similar deformity accompanies a fractured shaft of the ilium with displacement, but it differs from it in that there is a dropping of the quarter; the whole quarter shows a more rapid fall than the sound one from the internal to the external angle of the ilium, and except in very fat animals the latter can be felt intact on manipulation and the deformity recognized to be the result of a movement of the external angle, and not the consequence of fracture of a portion of it. The same remarks apply to deformity following fracture of the acetabulum, though it may be slight and easily overlooked. Multiple fractures produce a variable amount of deformity, depending on the extent and site of the fractures and in some degree on the effects of the violence responsible for the occurrence.

The deformity associated with fracture of the tuber ischii is, from its position, not very apparent. It takes the form of a flattening of the buttock at the side of the perinæum a little below the level of the anus, and is most readily recognized when viewed laterally on comparison with the sound side. An inflammatory swelling sometimes obscures the deformity for some days after the accident, and though of less frequent occurrence, the same holds good for fracture of the external angle of the ilium.

A symptom which, taken alone, possesses little diagnostic importance, but which is of considerable value in drawing attention to the seat of lameness in those fractures of the pubis and ischium in which the dependant lameness is not pronounced, is the appearance of a slightly-diffused œdematous swelling in the region of the scrotum (mammæ in the female) and the perinæum respectively.

The effects of a fracture are never confined to the bone alone, the surrounding soft structures always share to some degree in the injury, but in the majority of simple fractures this does not materially influence the results. The close proximity of large blood vessels or nerves, however, introduces possible serious complications, and these we sometimes find in association with fracture of the shaft of the ilium and of the pubis. In the former the terminals of the internal iliac artery and satellite veins bear a close relationship to the bone, and in displaced fractures

are sometimes ruptured with consequent fatal hæmorrhage. The veins, with their thinner walls, are naturally more easily ruptured, but both arteries and veins may be severed. Symptoms of severe internal hæmorrhage then quickly develop and death may take place within thirty minutes of the accident, though usually the process is slower and one to three hours may elapse before death supervenes. This discovery of a large swelling (hæmatoma) in the pelvis on rectal examination, coupled with the blanched mucous membranes and the other accompanying symptoms of hæmorrhage, permit of the recognition of this accident. It is to be observed that this unfortunate complication does not always occur coincidently with fracture of the shaft of the ilium. It is a risk inseparable from these fractures until the process of healing is sufficiently far advanced to ensure fixation of the fractured ends of the bone and may happen on the introduction of any cause liable to produce further displacement.

Similarly the obturator vessels and nerves may be injured where they lie in relation to the pubis in the course of their passage through the obturator foramen. Möller and Cadiot regard rupture of the obturator artery as the most common cause of fatal hæmorrhage in fracture of the pelvic bones. The obturator nerve may be divided by the fractured ends of the bone, or its function may be interfered with by pressure of the callus. In either case a rather striking symptom results. The obturator nerve supplies the following muscles: Gracilis, pectineus, adductor magnus, adductor parvus, and obturator externus, all of which are adductors of the limb, with the exception of the last named, which is an extensor of the hip. Since their nerve supply has been cut off they are paralysed; the action of the adductors is thus uncontrolled and as a consequence the limb is swung outwards in the act of moving it forwards during progression.

In fractures caused by severe crushing and accompanied by much displacement the fractured ends of the bone may penetrate the vagina or rectum, giving rise to hæmorrhage from these organs.

Occasionally in fracture of the external angle of the ilium, the soft tissues are severely injured without exposure of the bone and sinuses, or repeated abscess formation may follow. The detachment of small splinters of bone may lead to similar results.

Rational treatment readily remedies this condition, but neglect may lead to considerable burrowing of pus, which follows in some measure the direction of the fibres of the tensor fasciæ latæ, and a considerable quantity may collect in the loose tissue above the stifle joint, the overflow from which escapes by the original wound near the external angle of the ilium. This is not common, but may occasionally be met with in cattle.

In all the more severe fractures of the hip animals show some general disturbance. The expression is anxious and suggestive of acute pain, muscular tremors may be observed, especially of the muscles of the affected limb. There may be partial sweatings, the temperature commonly rises several degrees and there is some loss of appetite. These symptoms are best seen immediately after the accident, for they are transient and will, in a large measure, have passed off at the end of twenty-four hours.

It is seldom that much difficulty is experienced in diagnosing fracture of the external angle of the ilium or of the tuber ischii. The history of injury is usually available and the resulting deformity obvious. The detection of crepitus is the chief aid to diagnosis in other fractures, and when no deformity exists or results, definite diagnosis may depend almost solely on its demonstration. Valuable confirmatory evidence may be obtained by rectal or vaginal exploration, which permits of the examination of the pelvic surfaces of the pubis, ischium, and the lower part of the shaft of the ilium. The thin obturator internus and pyriformis muscles in part cover these pelvic surfaces, but swelling caused by fracture is recognizable through them. Rectal examination enables one to locate definitely the position of the fracture when these portions of the bone are the seat of injury, and it will also indicate the relationship which a fracture of the pubis bears to the obturator nerve, as it passed through the foramen of that name. Rupture of the blood vessels is indicated by a hæmatoma within the pelvis, recognizable on rectal examination.

Fractures of the pubis or ischium in which lameness is slight or absent are those in which the real nature of the injury is liable to be overlooked. In these, however, the detection of a scrotal or perineal swelling is, as already said, of value in locating the seat of lameness, though its absence must not be regarded as proof of the non-existence of fracture. Further examination and manipulation will usually result in the detection of crepitus, the diagnosis being confirmed by rectal exploration.

In the majority of simple hip fractures in the horse a favourable prognosis may be given, but in dealing with the larger domestic animals the economical side of the question must always be taken into consideration. Treatment may involve loss of work for a period as long as six months, depending on the site of fracture; but since the expense incurred in treatment consists almost solely of the cost of keep, it remains only to be decided whether the value of the animal and the chance of a useful recovery justify the expenditure. Every case of hip fracture will not make a useful recovery, but a sufficiently large percentage of those which are simple and uncomplicated do to justify treatment being recommended, provided the value of the animal makes it worth while. In cattle, slaughter is usually the best course from an economical point of view, except in the case of fracture of the external angle of the ilium or the tuber ischii. Young cattle sometimes make most unexpected recoveries from fractures, but it is impracticable to sling them and we are thus deprived of the chief measure at our disposal in the larger animals of obtaining some limitation of movement in the hip region.

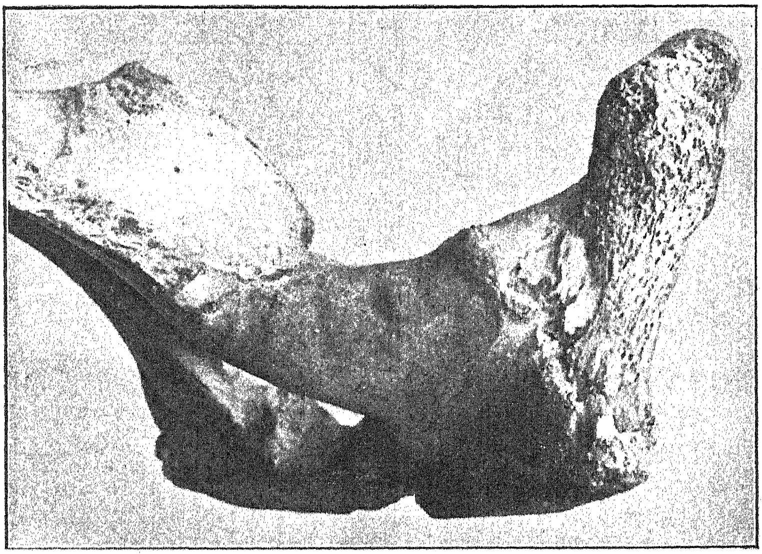
In the smaller animals (dog and cat) the cost of keep and treatment usually plays a secondary rôle and sentiment a primary one in deciding the course to be adopted. Whilst one may venture to promise good results in simple fractures, the owner must be warned that a long period of lameness may be expected and of the possibility of its remaining permanent when the acetabulum or the shaft of the ilium is implicated or the fracture involves more than one part of the bone.

Little doubt need be entertained of the result of treatment of fracture of the external angle of the ilium or of the tuber ischii. Lameness is, with very few exceptions, temporary, and one may safely venture to forecast recovery in from three to six weeks.

In other positions a longer period of rest is essential. As already said, fracture of the pubis predisposes to fracture of the shaft of the ilium by weakening the whole skeleton of the hip and sufficient time must be allowed to elapse to permit of a firm union before any strain is allowed to be thrown on to the injured bone. Similarly with fracture of the ischium. The minimum time which can be estimated with safety in working animals is

two months. No doubt under favourable circumstances a strong union may be effected in less time, but it must be borne in mind that only a small degree of pain is usually associated with these fractures, that the hip region cannot be immobilized in the larger animals and that in consequence of the almost continual movement of the limbs the conditions at the seat of fracture are not those most favourable to repair. This is evidenced by the fact that though repair eventually takes place crepitus may sometimes be recognized for two or three weeks after the receipt of the injury.

A period of three months should always be allowed after

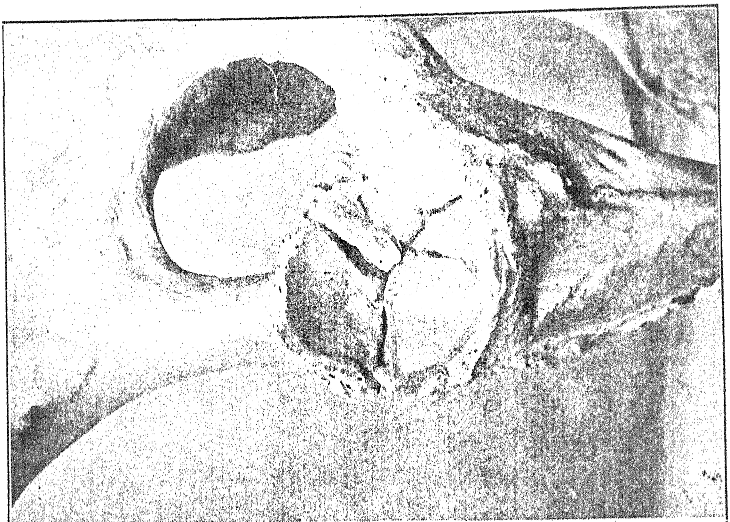


Displacement of the tuber ischii.

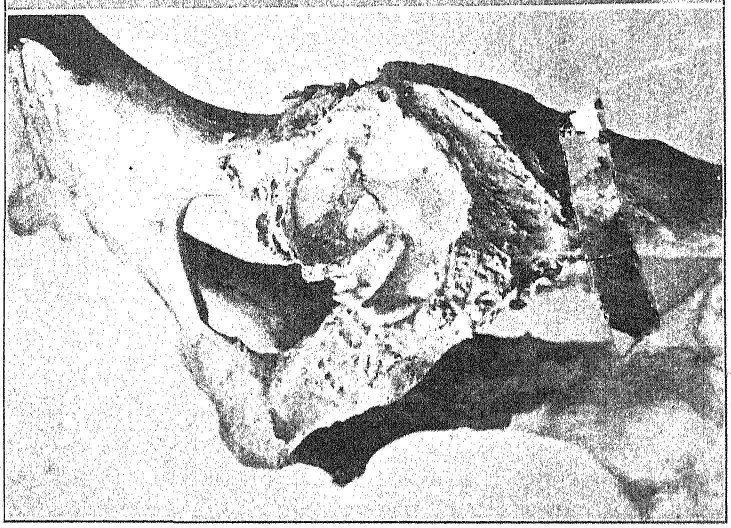
fracture of the shaft of the ilium. Two months is insufficient, for though under ordinary circumstances a fairly firm union may exist at the end of that time, it is not sufficiently strong to withstand the strain which the larger animals are liable to make on it. Refracture of the shaft of the ilium has occurred two months after the receipt of the original injury as the result of a horse playing when allowed his liberty in a loose box. At the end of two or three months animals are, as a rule, running sound; the muscles of the quarter are atrophied and considerable

deformity may exist, but the former is soon remedied by exercise and the latter does not interfere with the capacity for work.

Fractures of the acetabulum are usually regarded as hopeless, necessitating immediate slaughter, since it is expected that per-



Fractured acetabulum of carriage horse. Worked sound for eight years after recovery.



Fractured acetabulum of hunter. Worked sound for two years after recovery.

manent lameness will result, consequent on changes in the joint during the healing process, leading to interference with movement. These cases are not so hopeless as they may appear. Appended are two photographs of cases in illustration. The

first is the hip bone of a hunter mare, the second that of a carriage horse, which worked sound for two and eight years respectively after recovery. A period of three to six months is the time necessary to permit of a useful recovery and in most cases the longer period will be required.

When complications arise the aspect of the case is materially altered. Rupture of the larger blood vessels is followed by death. From a working point of view, obturator paralysis is nearly hopeless; it certainly is if the paralysis depends on division of the nerve, though if it be the result of callus pressure, restoration of function may take place as condensation of the callus and absorption of the inflammatory products around the fractured ends takes place. It will probably never be possible to determine during the life of an animal whether the paralysis is dependant on division of or pressure on the nerve, and the course decided on must largely depend on whether or not the owner feels justified, having regard to the value of the animal, in keeping him for a period of six months on the somewhat remote chance of having him eventually restored to usefulness.

Fractures through the symphysis heal badly on account of movement between the fractured bones and are regarded as incurable in the horse (Möller). Multiple fractures must be regarded as hopeless in the larger animals at least, the prospects of a useful recovery in the circumstances under which treatment has to be carried out are remote and slaughter is the most advisable and humane course. Slaughter should certainly be urged when the fracture has been caused by severe crushing and is accompanied by much displacement with laceration of the pelvic organs.

The possible influence of the callus on delivery of the young must be borne in mind in females, whom it is contemplated using for breeding. A large callus lessens the capacity of the pelvis and is a possible source of obstruction to delivery, but the definitive callus is not always a large one. Rectal examination will usually afford information on which an opinion may be based.

Pressure laminitis may develop in the sound foot as the result of constantly standing on it during treatment, introducing a troublesome complication and probably rendering an otherwise promising case hopeless on account of the pedal bone descending through the horny sole. This complication must be extremely

rare; it is infinitely more likely to develop in lameness arising from septic causes than it is from an aseptic condition such as exists in simple fracture.

Treatment of hip fractures may be summarized in one word—rest. Recovery may follow simple rest in a loose box, even in cases which appear far from promising; for example, the carriage horse, a photograph of whose hip bone is shown on page 142, received no other treatment than his liberty in a loose box for a period of about six months. If the best results are to be obtained however, horses should be slung in all fractures of the hip bone, with the exception of those in which the external angle of the ilium is involved, when slinging is unnecessary. It is difficult sometimes to convince an owner of the advisability of this course when the associated lameness is slight, as in fracture of the pubis or ischium, but it affords the only means practicable of ensuring the degree of stillness of the hip region requisite to a satisfactory and permanent union.

At the end of six to eight weeks most horses will be freely placing weight on the injured limb in the slings and gentle walking exercise may be commenced soon afterwards and gradually increased. It must not be ventured upon too early, however, and the animal should be replaced in slings until three months have elapsed. In fracture of the shaft of the ilium and the acetabulum blisters over the region, which are commonly recommended, are of no service in promoting recovery. Similarly in smaller animals, charges are of no practical value. Attempts to fix the hip by means of bandages in dogs are not satisfactory and rarely effect their purpose; nothing more is required than restricting the animal's liberty.

Simple treatment may be necessary to counteract the local inflammatory effects in fracture of the external angle, or the tuber ischii.

With reference to *post-mortem* examinations, it may be mentioned that in the event of death from rupture of the pelvic vessels, the hæmorrhage is extra-peritoneal and that the blood remains confined within the pelvis. In double fractures, such as those of the shaft of the ilium and of the pubis, it may be obvious that the former is of recent occurrence, whilst the edges of the bone in the latter are rounded and smooth from attrition, thus showing that it has been in existence for a period of time,

the duration of which can be approximately fixed by a shortly antecedent lameness of a slight and temporary character. When a history is available, a detached portion of the external angle of the ilium may be found in the connective tissue of the flank. The tuber ischii is seldom completely displaced from the body of the bone, osseous union usually takes place to a considerable extent producing an appearance as though the prominence had been bent downwards and outwards from the body of the bone.

COMPARATIVE ANATOMY OF SUPERNUMERARY DIGITS IN CERTAIN UNGULATES AS EVIDENCE OF THE INTER-RELATIONSHIP EXISTING BETWEEN THE VARIOUS SPECIES.

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First Article.

Cases of supernumerary digits, particularly in the domestic members of the ungulata, have frequently been recorded. Unfortunately such cases have been divested of much interest inasmuch as the published records have usually not included a dissection of the specimen so that no attempt has been made to bring out those morphological characters of interest to the comparative anatomist; and the only value attached to such records is that they are announcements of what are regarded in general in the light of monstrosities.

There is very little literature available on the subject.

In 1906 Warren* published a "Note on the abnormal hoofs of a sheep." Dupas† in 1905 reported a peculiar case in the horse. Arising out of the discussion on this case, Lesbre‡ published in 1906 an interesting article on "Supernumerary Digits in Solipeds," with a number of illustrations, the purport of which was to endeavour to classify them according to the theory of their origin. He separated those in which the digit appeared simply to split into two parts in the median sagittal plane and termed them Schistodactyles, stating that these were the most

* Warren, Arnold. *Ann. Natal Govern. Mus.*, Vol. i., pp. 109-110.

† Dupas, Leon. "Note sur un cas curieux et rare de didactylie chez le cheval." *Rec. Méd. Vétér.*, Paris, T. 82, pp. 563-566.

‡ Lesbre, F. X. "Note sur la polydactylie des solipedes. *Rec. Méd. Vétér.*, Paris, T. 83, pp. 78-84.

rare, and that they varied from "the simple bifurcation of the nail or phalanx up to complete division of the digit."

The writer* described in 1902 a peculiar case of supernumerary digit in the ox, which will be included in this series.

So far as can be ascertained, no attempt has hitherto been made to compare the anatomy of these abnormal digits in the various species.

A detailed examination of a selected number of such specimens in the horse, ox, and pig has revealed to the writer many points of interest as showing the inter-relationship existing between these different species of the order, and these are given in the following accounts in which more particular note is made of the bones, tendons, and ligaments.

For the convenience of reference, the specimens will be numbered.

CASE I.

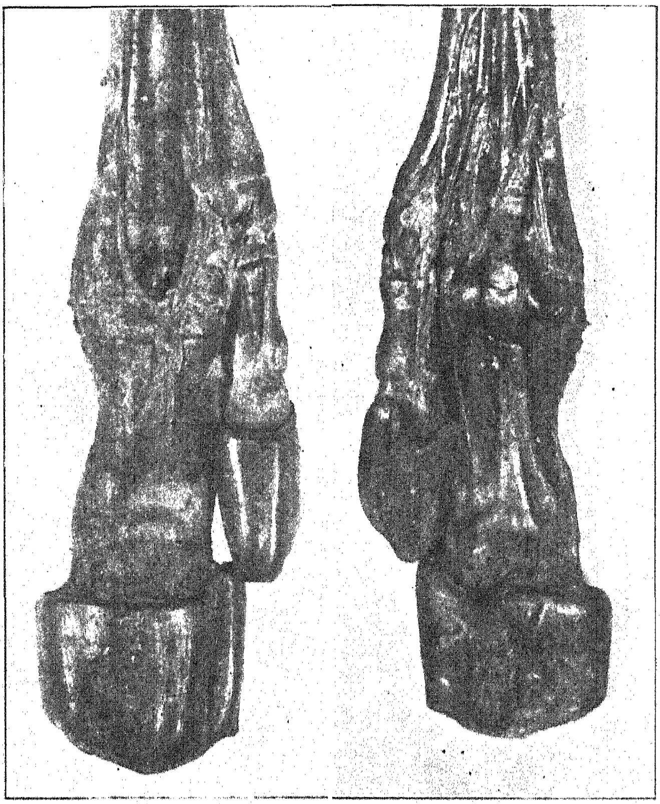
This specimen might be regarded as typical of those cases which are most frequently encountered—namely, those in which the supernumerary digit does not show a high degree of organization and is more or less a deformity.

It is the left manus of a foal presenting an internal supernumerary digit, which is very small as compared with the principal digit (Fig. I.), the toe of the hoof only extending to the coronet of the latter. A superficial examination of the specimen revealed no abnormality until the middle third of the metacarpal region was reached, when it could be detected that the inner small metacarpal bone broadened out inferiorly and did not terminate in the enlargement which is commonly designated as the button. The metacarpo-phalangeal joint was broader than usual, but the skin did not divide until the proximal epiphysis of the first phalanx of the digit was reached. In consequence, only that portion of the supernumerary digit, extending from the distal extremity of its first phalanx to the hoof, was enveloped in a separate fold of the integument. Externally the hoof did not present the usual conformation of that of the horse, but was more compressed from side to side, was convex externally, and concave on its inner surface, so that it bore a close resemblance to the hoof of the ox. On its inferior surface it presented a

* Share-Jones. A Case of Supernumerary Digit in the Ox. *Journal of Comparative Pathology*, Vol. xv., p. 143-146.

curved slit, the convexity of which was directed outwards. There was no trace of a frog. The whole of the exterior of the wall was covered by a layer of periople characteristic of the young unshod hoof.

The Tendons.—The tendon of the external extensor (extensor suffraginis) was well developed and was attached to the proximal



CASE I.

FIG. I. A. FIG. I. B.

Photographs of specimen in Case I. (skin removed). A, anterior aspect. B, Posterior aspect.

extremity of the anterior face of the first phalanx, slightly to the outer side of the middle line.

The tendon of the anterior extensor of the digit (extensor pedis) took the usual course down the front of the large metacarpal bone, but did not detach any branch of communication

to the external extensor. On the lower epiphysis of the large metacarpal bone it gave off a branch which passed directly outwards and blended with the origin of the anterior extensor tendon of the supernumerary digit in this manner, resembling the corresponding tendon in the ox. At the middle third of the first phalanx the tendon broadened out where it received the two divisions of the suspensory ligament and its ultimate insertion was into the pyramidal process of the terminal phalanx.

No anterior extensor muscle was present on the supernumerary digit, but its tendon was represented by a broad band which was attached to the front of the distal extremity of the inner small metacarpal bone. The band then passed downwards over the front of the first and second phalanges to be inserted into the pyramidal process of the third phalanx.

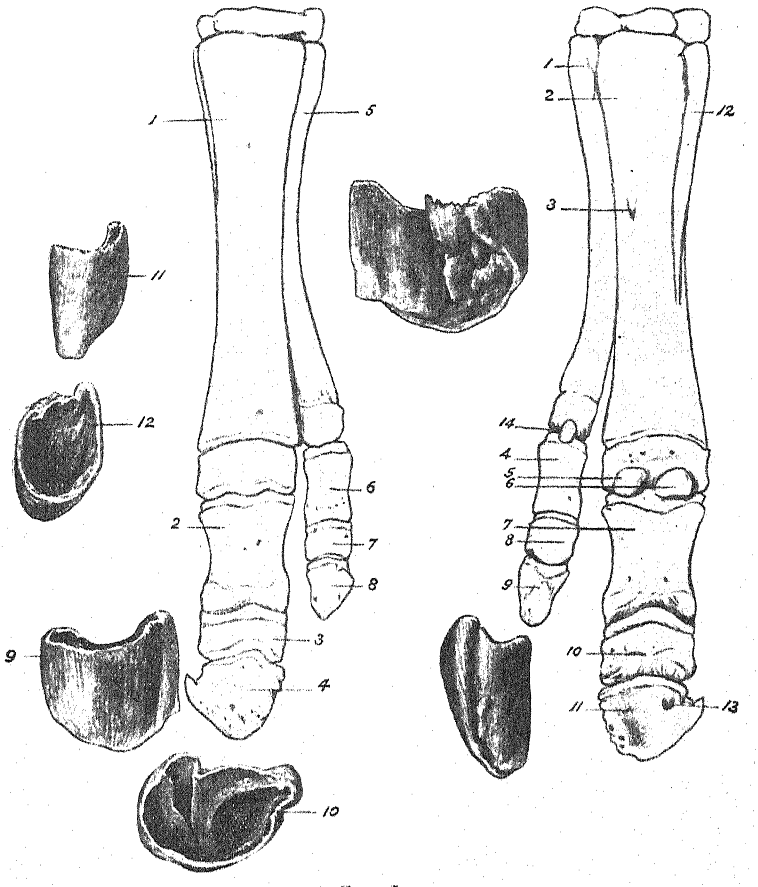
The superficial flexor of the digit (flexor perforatus) was quite normal and formed the usual ring for the passage of the tendon of the deep flexor at the back of the metacarpo-phalangeal joint.

The deep flexor of the digit (flexor perforans) at the middle third of the metacarpal region divided into two portions. One of these, the larger, took the usual course down the back of the principal digit, passed through the ring formed by the flexor perforatus, and was attached to the semi-lunar crest on the third phalanx. The other division, which was cordiform, passed obliquely downwards and outwards to reach the back of the supernumerary digit and became inserted into its terminal phalanx. Of this digit it formed the solitary flexor.

The Suspensory Ligament.—This was well developed on the principal digit and arose from the back of the lower row of carpal bones and the upper extremity of the large metacarpal. Above the fetlock it divided and the two divisions passed round to the front of the limb, one on either side the joint, each giving off a slip of insertion to the corresponding sesamoid bone. They joined the anterior extensor tendon on the front of the digit.

On the accessory digit this ligament was simply represented by a fibrous band which was attached superiorly to the inner small metacarpal bone on its inner surface, just below the head. Towards the lower extremity of the bone the ligament became much more expanded and was finally attached to the posterior surface of the sesamoid bone at the back of the metacarpo-phalangeal joint

The vessels and nerves were very rudimentary. The digit was supplied by branches of the large metacarpal artery and internal plantar nerve, which were detached from the parent structures at the middle third of the metacarpus. Passing on to the supernumerary digit, each divided into two small branches, which ran down, one on either side, and were ultimately lost near the second inter-phalangeal joint.



CASE I.

FIG. II. FIG. III.

FIG. II.—Bones and hoofs of Case 1 (anterior aspect). 1, large metacarpal bone; 2, 3 and 4, phalanges of principal digit; 5, inner small metacarpal bone; 6, 7 and 8, phalanges of supernumerary digit; 9, hoof of principal digit; 10, interior of same; 11, hoof of supernumerary digit; 12, interior of same.

FIG. III.—Bones and hoofs of Case 1 (posterior aspect). 1, internal small metacarpal; 2, large metacarpal; 3, nutrient foramen; 4, 8 and 9, phalanges of supernumerary digit; 5 and 6, sesamoid bones of principal digit; 7, 10 and 11, phalanges of principal digit; 13, plantar foramen on terminal phalanx; 14, sesamoid bone of supernumerary digit.

The Bones.—The large metacarpal bone (Fig. II, 1) presented postero-internally throughout the whole length of its diaphysis a roughened area for the attachment of the interosseous ligament uniting it to the inner small metacarpal. This area was narrowest at the middle third and gradually became broader upwards and downwards as it approached the epiphyses. The distal extremity of the bone presented inwardly a facet for articulation with the first supernumerary phalanx. The phalanges of this digit did not present any notable feature.

The internal small metacarpal bone (Fig. II. 5) showed several peculiarities. It was, as might have been expected, very much longer than the corresponding external bone. The upper third was larger and its shaft was rod-like and approached the cylindrical in shape. The diameter gradually decreased from the upper extremity to the middle of the bone and then progressively increased until the distal epiphysis was reached. It has already been mentioned that no nodular process or "button" could be felt in the undissected specimen. The distal extremity was in fact larger even than the proximal. Moreover, it ossified from a centre quite distinct from that of the shaft. The line of division between the diaphysis and lower epiphysis was still very distinctly marked. The lower extremity presented a flat facet for articulation with the facet already mentioned on the inner lateral aspect of the lower extremity of the large metacarpal bone. Inferiorly, the bone was articulated with the first phalanx and also with the single sesamoid bone possessed by this digit. The last-mentioned bone was very small and differed in shape from those of the large digit (Fig. III. 14). It was not of the regularly three-sided pyramidal shape, but was elongated from above to below, and resembled that of the ox. Its posterior surface was curved in the vertical and transverse directions. Over this surface the branch from the flexor perforans tendon played. The tendon being spread out over the bone helped to keep the latter in position.

The first phalanx (Fig. II. 6) presented marked differences from the corresponding bone in the fully-developed digit. It was very much compressed from side to side and in general appearance was not unlike one half a normal bone sawn through vertically. Its inferior extremity showed two small articular convexities separated by a shallow antero-posterior groove, also

articular. There was no trace of the V-shaped roughened area which forms such a distinctive feature of the posterior surface of the normal bone. The second and third phalanges (Fig. II. 7 and 8) also bore a general resemblance to one half the corresponding bone in the mature digit. The lower face of the terminal phalanx was flattened and presented a tiny foramen, which evidently corresponded to the plantar foramen of the fully-developd bone.

On the principal digit there were two sesamoid bones (Fig. III. 5 and 6). The outer was the larger. In shape it approached the pyramidal. The inner was irregular.

The second and third phalanges of this digit presented a normal appearance and call for no remark.

The terminal phalanx (Figs. II., 4 and III.. 11) was peculiar. On examining the exterior of the hoof of this digit, it was observed that the anterior aspect of the wall presented a deep vertical grove towards the inner side (Fig. II.. 9), giving the hoof an appearance which suggested that an attempt was being made to cut off a portion.

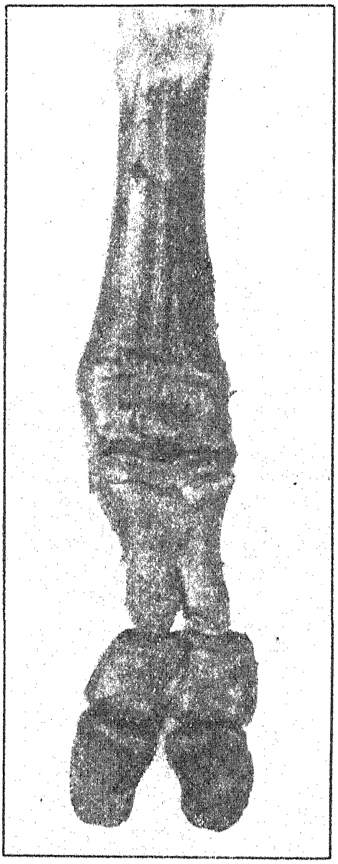
The reason for this became apparent when examining the terminal phalanx, for the bone presented an asymmetrical appearance, the outer portion being very much better developed than the inner. The latter was devoid of both basilar and retrossal processes. The inferior surface of the bone was slightly concave, and was not divided into solar and tendinous areas, since the semi-lunar crest was absent. Moreover, there was only one plantar foramen (Fig. III.. 13). This was the outer and was abnormally large. The place of the internal plantar foramen appeared to be taken by a small aperture which was found midway between the heel and toe on the inner border of the bone.

CASE II.

This is the left manus of a foal, the extremity of which is bifid. It represents a typical member of the Schistodactyles of Lesbre.

There was nothing abnormal about the external appearance of the metacarpal region and the fetlock presented the usual appearance, but there were two separate hoofs and the digits were separated up to the first inter-phalangeal joint, the slit between the two folds of the integument extending to the inferior third of the first phalanx.

The Tendons.—Upon removing the skin (Fig. IV.) it was found that the tendon of the external or lateral extensor was attached to the antero-external aspect of the superior extremity of the first phalanx. The anterior extensor tendon divided into two portions in front of the metacarpo-phalangeal joint. The two divisions were of equal size and each passed down the limb



CASE II.

FIG. IV.—Photograph of the anterior aspect of the specimen after removal of the skin.

to be inserted into a roughened elevation in the position of the pyramidal process of the terminal phalanx.

There was a similar division of the superficial and deep flexor tendons. The division of the superficial flexor was less complete than was that of the deep. The two fibrous tubes formed

for the passage of the latter were distinct from one another only in their inferior half, and superiorly were firmly united.

On the proximal extremities of the second phalanges very rudimentary complementary cartilages were present and the divisions of the superficial flexor tendon were attached to these bodies. The divisions of the deep flexor tendon (flexor perforans) were inserted into rough areas on the inferior aspect of the terminal phalanges.

The Ligaments.—The suspensory ligament took origin from the lower row of carpal bones and the upper extremities of the metacarpals. Running down the channel formed posteriorly between the large and small metacarpal bones, it divided just above the metacarpo-phalangeal articulation into two portions. These ran round to the front of the limb, each, whilst so doing, giving off a slip of insertion to the corresponding sesamoid bone. Each division ultimately joined the corresponding branch of the tendon of the anterior extensor of the digits.

The inferior sesamoidean ligament had a most peculiar arrangement. What corresponded with the superficial division was a vertical band, which, in its inferior third, was slit, the two portions being inserted one into each of the rudimentary complementary cartilages respectively. The middle division did not possess a vertical portion, but there were present two powerful strands which converged to meet inferiorly at their insertion into the posterior surface of the first phalanx. They were, however, very much shorter than the corresponding strands ordinarily found. No crossed bundles corresponding to the deep division were discovered, but there were present two powerful vertical strands. Each descended from the base of one of the sesamoid bones and was attached inferiorly to the corresponding division of the distal extremity of the first phalanx on its posterior aspect and immediately above the articular surface. This ligament thus bore a resemblance to that of the ruminant.

The Bones.—The large metacarpal bone (Fig. V. A, 2) presented the usual features. It was, however, somewhat more expanded at its superior extremity and its shaft relatively narrower and more cylindrical, in this respect resembling a large metatarsal bone.

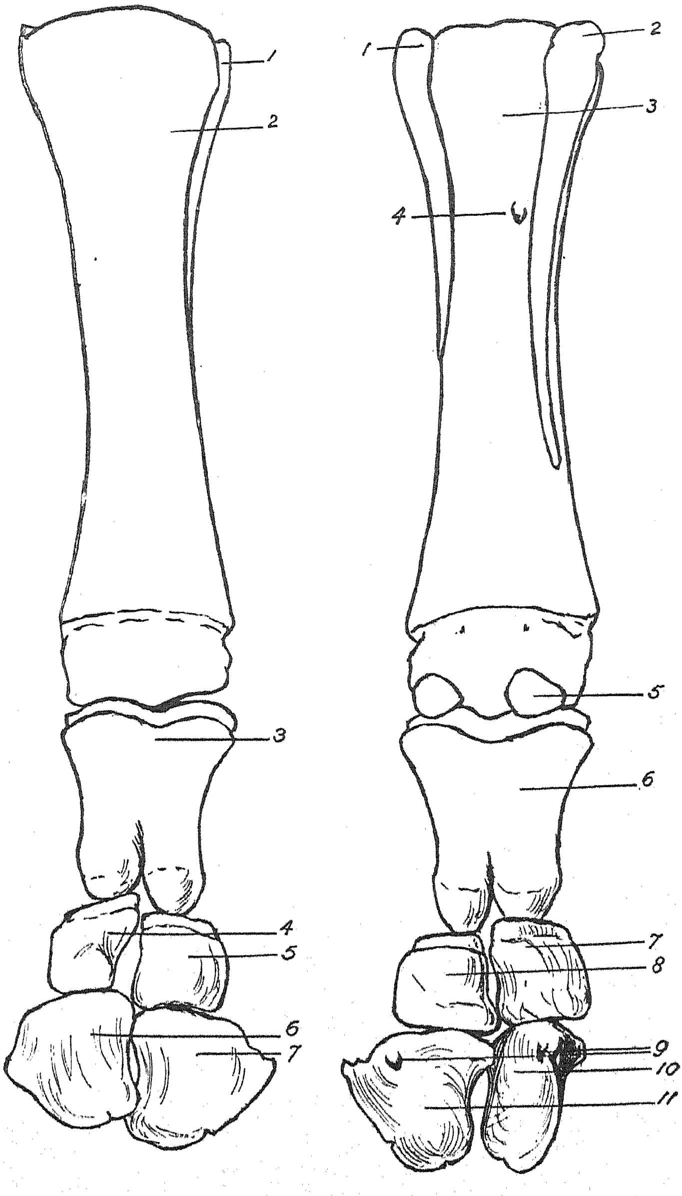
The inner splint bone (small metacarpal) was about an inch longer than the outer. Each terminated inferiorly in a small but well-defined nodular "button." The bodies were distinctly rod-

like and tapered very gradually towards the buttons and the edges were rounded off.

Two sesamoid bones were present (Fig. V. B, 5). These in shape approached a three-sided pyramid, but their external surfaces were markedly convex and did not show a roughened pit for the attachment of the lateral sesamoidean and superior sesamoidean ligaments. There were no peculiarities in the upper half of the first phalanx. Its lower half, however, was extremely small and compressed from side to side. A vertical mesial fissure extended up the shaft from the inferior surface, dividing the lower third into two symmetrical portions. Each of these was in the form of a rod, which was compressed laterally. The inner rod was slightly thicker than the outer. Each rod presented inferiorly a surface convex in all directions, which was smooth and articulated to the superior surface of the corresponding second phalanx.

The Second Phalanges (Fig. V. A, 4 and 5, B, 7 and 8).—There were two of these. Each was of a most extraordinary size and shape and appeared too large, and ill-adapted to be carried by the corresponding portion of the first phalanx. The superior surface was smooth and presented a shallow cup-like facet for articulation with the first phalanx. The inferior surface was much more extensive and undulating. It presented a very slight depression in the place of the well-marked antero-posterior groove usually found. It was smooth for articulation with the terminal phalanx and the area for articulation encroached to a considerable degree upon the posterior surface of the bone, but this encroaching portion was undivided and no notch was present. The anterior surface was slightly convex, the external surface markedly so. These surfaces blended with each other since the antero-external border was rounded off. The antero-internal border was sharper and better defined. In its length it was curved with the concavity directed inwards. The posterior surface was relatively more extensive than the corresponding surface in an ordinary second phalanx. It was concave in the transverse direction.

The Terminal Phalanges (Fig. V., A, 6 and 7).—At first glance each appeared not unlike one-half the ordinary terminal phalanx, but a closer examination revealed a striking similarity to the corresponding phalanx in the ox. The superior surface



CASE II.

FIG. V. A. FIG. V. B.

FIG. V. A.—*Anterior aspect.* 1, small metacarpal; 2, large metacarpal; 3, first phalanx; 4 and 5, second phalanges; 6 and 7, third phalanges.

FIG. V. B.—*Posterior aspect.* 1 and 2, small metacarpals; 3, large metacarpal; 4, nutrient foramen; 5, sesamoid bone; 6, first phalanx; 7 and 8, second phalanges; 9, plantar foramina; 10 and 11, terminal phalanges.

was articular and moulded accurately on to the surface of the second phalanx. The inferior surface, relatively much more extensive than that of the ordinary third phalanx, presented a very faint curved roughened line in the position of the semi-lunar crest, which divided the surface into two portions, corresponding respectively to the solar and tendinous areas. The anterior area was much the more extensive, was smooth and distinctly concave. The posterior area was flat but roughened. This area presented towards its outer end a well-marked circular plantar foramen, from which there extended backwards a very faint groove. The anterior surface was convex from side to side and slightly concave from above to below. In its lower half this surface presented a large number of very small foramina. One was much larger than the others and corresponded to the preplantar foramen. From it there was a faint trace of a groove running backwards to the posterior angle of the bone.

The antero-superior border was in the form of a convex ridge, so that the elevation corresponding to the pyramidal process extended right across the bone. There was no depression in the position of the pit into which the antero-lateral ligament is inserted. The inferior edge was sharp and sinuous. It terminated posteriorly in a backwardly-projecting piece of bone—a poorly-developed retrossal process. There was no trace of a basilar process. The inner border was sharp and curved with the concavity directed inwards. The postero-superior border was thick and rounded in the transverse direction, and longitudinally it was almost straight. It presented no facet for articulation with the navicular bone, since this bone was entirely absent.

The Hoof.—The anterior and outer surfaces of the wall were convex in the transverse direction and blended with each other. From above to below they were almost straight. The inner surface was flat and continuous with the anterior surface, the border separating them being rounded off. On the inferior aspect there was an irregular distorted structure which resembled half a frog twisted spirally. Posteriorly it presented an enlargement corresponding to one of the frog bulbs. The apex of this structure extended quite close to the anterior border of the hoof, so that the area corresponding to the sole was extremely small. In the interior of the hoof was a deep cutigeral groove and below this the horny laminæ were both numerous and quite regular.

Inferiorly there were two prominent horny ridges with sharp edges. The ridges met anteriorly, but posteriorly were widely separated. Their edges were very sharp. There was no trace of a frog stay.

RABIES AND ITS CONTROL IN INDIA.

By Captain E. CLIVE WEBB, F.R.C.V.S.
Army Veterinary Corps, Aldershot.

(*Continued from p.* 105.)

Protective Inoculation.

Pasteur introduced a method of protective inoculation, although it is seldom used except in the case of people who have already been bitten by a rabid animal or animal suspected of rabies, and are therefore already infected. Hence its use is more in the nature of a curative.

The material used as a vaccine is the spinal cord of a rabbit that has been inoculated with what is called the fixed virus of rabies. This fixed virus is an intensified virus and is obtained by the method of passage through a number of generations of rabbits. The period of incubation in rabbits inoculated with the ordinary virus of rabies from a natural case of the disease is fourteen to fifteen days. The fixed or intensified virus has an almost constant period of incubation of six or seven days.

After removal of the cord from the rabbit dead of rabies it is partially desiccated by being suspended in a jar over some fragments of caustic potash at a temperature of about 23° C.

A cord of fourteen days' desiccation becomes innocuous, and cords exposed for shorter periods are graded in their virulence.

The system of vaccination is as follows:—For the first two days emulsions of cords of low virulence are inoculated, commencing with cords of fourteen and thirteen days' desiccation and following on the second day with cords of twelve and eleven days' desiccation. The virulence of the cords employed is rapidly worked up, until at the end of the first week a cord of only three days' desiccation may be used. During the second and third weeks of treatment changes are rung on cords of between three and five days' desiccation.

The treatment may, of course, be modified according to the

severity of the bites sustained. The explanation of the efficacy of the vaccination used on patients presumably already affected with rabies is that owing to the virus employed being the fixed virus and having a shorter period of incubation than the ordinary virus in a natural case of rabies, the person inoculated is rendered immune before the infection by the natural virus is able to secure a footing.

Control of Rabies in India.

This sub-heading would be more correct were it worded "Want of Control of Rabies in India." The state of things as at present exists can only be described as lamentable. Year after year a large number of people, both European and native, make the journey to the Pasteur Institute at Kasauli for antirabic treatment, owing to their having been bitten or licked on an abrasion by rabid dogs or dogs suspected of rabies. Nor does this very large number who present themselves at the Institute for treatment represent anything approaching the actual number of human beings who have sustained bites by actually rabid or suspected dogs in any one year, since a very great number of people, and especially natives, will not undertake the journey either from prejudice against the treatment or on account of the expense and discomfort involved.

From this it will be seen that, owing to the entire absence of any adequate measures for the suppression of the disease or for its control, the inhabitants of India are rendered liable to the danger of inoculation, which danger might be minimized a thousandfold were practical and energetic measures adopted by Government. In speaking of the disease, it must be borne in mind that I refer to the disease in dogs, which species, from a practical point of view, is the only one which can be taken into consideration.

In any measures which Government might think fit to adopt, not the least important is the education of the lay public in the recognition of the disease and the immediate steps to be taken in the event of the occurrence of a case.

The risk of infection to human beings is increased a thousand-fold not only by the painful ignorance on the part of the lay public, both European and native, with regard to the recognition of suspicious symptoms, but also by what in many instances

amounts to culpable negligence, especially on the part of owners of dogs.

I was particularly struck by an editorial article which appeared in the *Journal of Comparative Pathology and Technology*, vol. viii., 1895, as illustrating the ignorance of the lay public at that time, and also the grievous havoc that may result therefrom. Similar cases have come under my notice in India. The article above referred to gave the following case: A man who lived at Croydon was bitten by his own dog, the attack being quite unprovoked. The dog was afterwards taken to a Miss Jeffries and chained up, though apparently not under suspicion of rabies. It escaped and bit a little girl on the hand, and afterwards returned to its own home and bit a boy in the leg. At this stage a veterinary surgeon was called in and recognized the case as one of rabies and had the animal destroyed. The owner refused to believe that such was the case and refused to proceed to Paris for treatment. The case was afterwards confirmed, but even then the owner could not be persuaded to undergo Pasteurian treatment, and as a result succumbed to hydrophobia.

In this case it will be seen that ignorance was not only the cause of death of the offender, but also endangered the lives of two children. Other cases I have known in India where an owner of a dog has been warned of the suspicious nature of his dog's demeanour and has still neglected to either have the dog destroyed or to take proper steps to secure the animal against any possibility of its breaking away. What is the result in such a case? The dog, whose demeanour perhaps had only been one of apparent sulkiness and passive resistance, suddenly becomes frantically rabid, breaks away, and in its mad career probably bites many other dogs, and possibly human beings, before it is ultimately destroyed. Such cases as these can only be classified as culpable negligence. It is in this way that the disease is fostered and widely spread, and such cases are only too common. I am strongly of the opinion that legislation is necessary in this direction to prevent such cases of glaring criminal negligence and to bring home to the perpetrators the enormity of their offence by the imposition of a heavy fine. No man is justified in endangering the life of a fellow-creature, and yet such is done thoughtlessly and only too frequently.

If an owner is warned that his dog is under the slightest

suspicion of being rabid, then there are only two courses open: either the dog should be destroyed immediately, or, if he doubts the correctness of the diagnosis, it is incumbent on him to take every precaution as if the dog were rabid. Such precautions involve the proper segregation of the patient so as to render any possible contact with man or beast outside the range of possibility. To merely chain a dog up does not meet the case. It should not only be strongly secured by a chain and collar to a staple or other suitable object, but should also be kept within four walls, and the key of the door giving entrance to such a place should remain in the owner's possession. If the symptoms shown by such a dog were those of rabies, any doubt will be removed within ten days.

It is also my very strong opinion that an owner is not justified in getting any attendant, whether native or European, to look after and feed such a dog without fully explaining the nature of the case and putting the worst possible complexion on the danger which he is running. Owners are too apt to allow a native "sweeper" to attend a dog under suspicion without adopting this course or even minimizing the danger and pooh-poohing the idea of the dog being "poggle."

Further Reasons why the Disease in India Remains Unsuppressed.

I have already stated that as far as I am aware no steps are taken by Government for the suppression of rabies. A rabid dog may go through a town or cantonment and bite a dozen or more other dogs. The owners of these latter may get advice as to the measures which they should adopt in the case of these bitten dogs, but if they were informed that the only safe measure was to strictly segregate for six months the majority would fail to carry out such a precaution where there is no compulsion, owing to the trouble it would involve. In support of what I say, and also as illustrating the general ignorance of the lay public as to the necessary measures to be taken, I give the following instance:—

I was making a trip last year through the hills from Murree to Abbottabad. During the first day's march we halted for lunch outside a certain military hill station and picnicked close to the main road. During lunch a rabid dog came galloping along the

road, hunted by several officers on ponies. Some time afterwards I met one of the officers who was in the hunt after this same rabid dog and questioned him about it. He informed me that this dog had bitten about fourteen other dogs in that one morning. Asked as to what steps were taken in the case of the dogs which had been bitten, he replied that the owners of the latter had been told to keep them tied up for ten days, and if they were all right at the end of that time they could be let loose!

Whoever was responsible for this advice was evidently a little at sea as to the period of incubation in rabies and was mixing it up with the period necessary for ascertaining whether a dog is rabid after it has shown symptoms suspicious of rabies.

Under such circumstances is it to be wondered at that the disease cannot be kept under control?

SUGGESTIONS FOR THE CONTROL OF THE DISEASE.

At the second International Veterinary Congress, held in 1863, the Committee resolved that the introduction and strict execution of a rational supervision of dogs was the surest means of preventing and ultimately extirpating rabies.

Were a committee formed in this present year, with all the added knowledge and facts of recent years concerning the disease, it could not frame a more comprehensive resolution or one that aimed more at the root of the question.

It is this rational supervision of dogs which is required in India at the present day, and there is no reason whatever why a workable scheme should not be formulated, aiming at such supervision, and although in a country like India ultimate extirpation of the disease could not be expected owing to the fact that wild animals, and especially jackals, act as reservoirs, yet the disease could to a very large extent be suppressed and kept under control were it grappled with in the canine species only.

Before suggesting regulations which would be practicable in a country like India, I will first summarize the regulations contained in the Order of the Board of Agriculture, March 23, 1897, known as the Rabies Order of 1897, since it may be taken that the ultimate stamping out of the disease in Great Britain was due to this Order. The salient points are as follows:—

(1) Compulsory notification of a case of rabies or suspected rabies.

(2) Compulsory slaughter of dogs diseased, suspected, or of dogs bitten by a diseased or suspected dog.

(3) *Post-mortem* verification of a case of rabies.

(4) Compulsory isolation of dogs which have been exposed to infection (*i.e.*, that have been in contact with a rabid dog, whether known to have been bitten or not).

(5) Seizure, detention, and disposal of stray dogs.

(6) Disposal of the carcase of a dog affected with or suspected of rabies.

(7) Regulations as to disinfection of buildings, &c.

(8) Punishment for infringement of the Order.

The last case of rabies occurred in this country in 1902. The re-introduction of the disease has been prevented by accessory Orders dealing with the importation of dogs—viz., the Importation of Dogs Order of 1901 and the Importation of Canine Animals Order of 1909. In dealing, however, with the disease in India no such orders as the latter could be of any practical value.

The Above Regulations with Regard to their Applicability to India.

The first necessary step in India is to decrease the number of dogs and fix the responsibility for their ownership. By this means the uncontrolled roamings of ownerless pariah dogs would be reduced to a minimum. The only method by which this end can be effected is to put a tax on dogs, to insist on their being registered, and at the same time to enforce the wearing of a collar with the name of the owner engraved thereon. The practicability of this suggestion may be questioned, but in my opinion it is perfectly feasible, and even if such a law were not made universal it could be applied to certain limits to commence with—*e.g.*, to all towns of any size (including all cantonments) and to all villages and areas within a certain radius of such towns. The tax need not necessarily be a large one, and, however small it were made, it would be an enormous source of revenue to Government. It might be argued that the vast majority of native dog owners are too poor to pay such a tax. With this I disagree, and am confident that a small tax amounting, say, to a few annas a quarter would not prevent even the poorer class of native from keeping a watch-dog if he considered such to be necessary. The only effect which such a tax would have would be to prevent

natives from keeping several dogs where one would be sufficient for their needs, and such is the result aimed at. Nor in framing such an Order do I consider that it would be wise to exempt sporting dogs, since the tax would be so small as not to prejudicially affect sport, and it would be difficult to discriminate between sporting and non-sporting dogs. Natives are fond of keeping dogs of the greyhound type which they use for coursing. If such dogs were exempted the object of the taxation would be frustrated.

At the present time every native village and bazaar is swarming with pariah dogs, many ownerless, the majority half starved, mangy, and repulsive. The native is particularly averse to taking life and would not do so in the case of a dog, even knowing it to be ownerless and starving, or even perhaps suffering from some incurable disease. Dogs of this sort, including a number which have owners, are left to maintain their existence by scavenging. It might be argued that these pariah dogs are necessary from a sanitary point of view for scavenging purposes. With this I cannot agree. In any case, judging from their condition, the scavenging might be effected by a quarter their number. Moreover, there are other scavengers in the form of vultures, kites, hawks, &c., which are abundant near every human habitation.

Another necessary step in any movement for the suppression of rabies is the education of the public as to the nature of the disease, its recognition, the dangers incurred in not taking immediate action in any case of suspected rabies, &c., &c. Such education could only be effected by means of pamphlets freely distributed and notices posted on public buildings. The poorer classes of natives are mostly unable to read, and therefore would not benefit greatly by such methods; but if those classes able to read were in possession of the more important facts concerning the disease and its prevention, such knowledge would to a certain extent diffuse to the uneducated classes.

With regard to the regulations mentioned above and contained in the Rabies Order of 1897, they could very well be applied with certain modifications to India:—

(1) Notification of cases of rabies or suspected rabies must be made obligatory. This notification would have to be made to the civil authorities—*i.e.*, to a tehsildar (magistrate) or to an officer

of the C.V.D. or other authority appointed by the Deputy Commissioner of the district for the purpose. Arrangements would then have to be made for the case to be seen by a veterinary officer or veterinary assistant. As veterinary officers of the C.V.D. are so few and scattered, and are continually on tour during the cold weather, the co-operation of the veterinary officers of the A.V.C. would be necessary for the carrying out of the duties of inspectors, or the duties might be relegated to the trained staff of native veterinary assistants of the C.V.D., whose diagnosis must be accepted as final. It would then be necessary for the inspector to put in force the powers conferred by the Act. He would have to give orders *re* the slaughter and disposal of the carcase.

(2) Dogs affected with rabies would be immediately slaughtered.

In a country like India, where the disease cannot be stamped out even by the most drastic measures, the compulsory slaughter of dogs suspected of rabies or of dogs bitten by diseased or suspected dogs would not be justifiable.

In the case of dogs suspected of rabies—*i.e.*, showing suspicious clinical symptoms—these would have to be strictly segregated in an enclosed space (room, stable, &c.), securely chained so as to avoid the remotest possibility of contact with man or beast. It would be part of the duties of an inspector to approve any such place and to declare the dog free at the end of such period of segregation. In the case of dogs bitten by a diseased or suspected dog, a six months' period of segregation must be strictly enforced. This would involve the exercising of the dog on a lead, and the segregation would be similar to that enforced in the case of dogs imported into Great Britain at the present time, excepting that the dogs would be left with their owners, who would be responsible for carrying out the regulations.

I do not for a moment suggest that the segregation would in every case be carried out properly; at the same time flagrant breaches of the regulations could be punished, and the mere fact of such regulations existing would deter the majority of people from keeping such dogs owing to the trouble involved in carrying them out, and would therefore have their dogs destroyed in preference.

(3) *Post-mortem* verification must be insisted upon in all cases in which it is possible, and where it is known that the dog has bitten a human being or other dogs, a portion of its brain should in all cases be sent to the Pasteur Institute for verification.

(4) Compulsory isolation of dogs which have been in contact with a rabid dog, but are not known to have been bitten, would be quite impracticable in India.

(5) Seizure and destruction of stray dogs must be rigidly enforced.

(6 and 7) Regulations *re* the disposal of carcases of affected or suspected cases, and also *re* the disinfection of buildings, &c., would be necessary.

(8) Punishment for infringement of the Order should be rigidly enforced.

It is only by the enforcing of some such orders as the above that control of the disease can be hoped for.

Evasions of the law would, of course, be plentiful. On the other hand, news travels very fast in India, and in many cases where a rabid dog runs riot and bites other dogs, the fact of such dogs having been bitten and the names of the owners thereof is soon public property. Under such circumstances the owner would find it difficult to hush the matter up and evade the law.

SUGGESTIONS FOR DEALING WITH CANINE PATIENTS IN INDIA.

In a country like India where rabies is rampant it is as well to adopt certain precautions in one's dealings with canine patients brought for treatment. In the first place it is as well to suspect every strange dog, and it is a wise precaution never to allow any dog, whether one's own or a strange one, to lick one's bare skin. It is a common habit of lovers of animals, and of dogs in particular, to pat them, and the latter by way of showing their affection will usually attempt to lick the hand. This habit of fondling a dog which appears friendly should be avoided.

The wisdom of this advice will be seen when one remembers that the saliva of a dog becomes infective possibly several days before clinical symptoms of the disease are manifested, and infection may be brought about by a rabid dog licking an abrased surface. Moreover, it should be remembered that cases of rabies frequently crop up in which there has been no previous history of the animal having been bitten, and therefore no means by which a warning might have been given of any possible danger.

Secondly, in the case of dogs brought by attendants or their owners on leads for treatment, it is a wise precaution to first question the attendant as to the nature and history of the illness before commencing to examine the patient and not to commence the manipulation first. During such cross-examination one might elicit information leading one to suspect rabies, in which case one would be doubly on one's guard in any manipulation that might be necessary. During the manipulation of any patient, whether suspected of rabies or not, avoid as far as possible getting the hands soiled with saliva, more especially so if there happens to be abrasions on one's skin. It is also well to acquire the habit of immediately washing the hands in suitable disinfectant after manipulating the mouth of any dog.

Lastly, should the appearance of the dog or the cross-examination of the attendant lead one to strongly suspect rabies, no amount of manipulation, such as opening the patient's mouth and gazing down its throat, can help to confirm one's suspicions, and since no useful object is to be attained, handling the patient is best avoided altogether. One is not paid to run unnecessary risks, and suspicions once aroused are not easily allayed. Therefore, the safest course in such a case is to take immediate steps to have the animal segregated in the way detailed above for dogs showing symptoms suspicious of rabies. If the owner is willing it would be better to advise immediate destruction, provided the patient is not known to have bitten any other dog or human being.

A STUDY OF THE GUTTURAL POUCHES OF THE HORSE.*

By WALTER STAPLEY, M.D., M.R.C.V.S.,
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A KNOWLEDGE of comparative anatomy is apt to induce the belief that many of the variations of structure existing in different species of animals is due to some form of force operating on animal tissues. An excellent example of force dominating shape is displayed in the thorax of the horse. The weight of the horse is largely carried on the sides of the ribs, from which results a lateral narrowing of the thorax and a driving backward toward the loin of the lung; consequently it becomes necessary for the

* Read before the Royal Society of Victoria.

horse to carry eighteen pairs of ribs, so that the thoracic content may be accommodated. Man's upright position has removed lateral, restricting forces from the sides of his chest; the lightness of lung tissue, unrestrained by such pressure, has caused the human lung to encroach on the neck. It is noteworthy that with ascent of the lung in the neck only twelve pairs of ribs are found, and the last or lower rib usually showing atrophic changes.

Cervical ribs are occasionally found in men and in women; they are, however, reported to be three times as common in women as in men. Whether they exist in aboriginals I do not know. The fact that the costal breathing of cultured women is said not to occur in native races leads me to think that in all probability cervical ribs are commonly found associated with atrophy of the upper limb. Surgeons have removed these neck ribs for the relief of pain. This pain is regarded to arise from stretching of the brachial plexus and the subclavian artery; it is not improbable that pain may occur during the development of these structures from an irritated pleura. From this irritated pleura arises the demand for a rib to protect the unprotected lung, and the pain arising from the same source splints the area whilst the rib accustoms the structures, into which it is thrust, to the annoyance of the invasion.

I have prefaced my remarks on the guttural pouches of horses by this reference to force operating on the chest because it sheds some sidelight on the more hidden force effects calling into existence the hernial modifications of the auditory tube of the horse. Between the lateral and median fibro-cartilaginous laminæ of the auditory tube the mucous membrane of the tube finds its exit, in sac form, into the retropharynx. Such an escape of the mucous implies an atrophy of the membranous lamina of the auditory tube. The cause of this atrophy cannot at once be seen by dissection. Searching these tissues to find the cause of this obliteration of the membranous lamina we are struck by two remarkable features in and about the throat of the horse. First the narrowness is almost as striking as the great depth of the inter-mandibular space; secondly, the stylo-hyoid bone (epihyal) reaches its highest development in the horse. Upon these two facts largely depends the development of the guttural pouches. The mucous membrane of the tube has probably been dragged out of the tube by adhesion of the stylo-hyoid bone with the membranous lamina

and through it adhesion to the mucosa and stylo-hyoid has occurred. The development of depth of the mandible caused a descent of the larynx, with which organ were carried down the stylo-hyoid bones. The mucous folds once in the retropharynx were spread to their present confines by flexion and extension of the atlo-occipital joint, &c., through adhesion of the submucosa with the surrounding structures.

Atmospheric pressure has not produced these mucous sacs. They are to be found in the fœtal foal; they are delicate sacs even in an old adult. Had they been submitted to pressure during life they should show considerable thickening. The entrance to these sacs is of sufficient size to prohibit pressure greater than atmospheric within these sacs.

The narrow and deep space through which passes the laryngo-pharynx is roofed by the base of the skull; walled by the unyielding branches of the mandible and the modified digastric muscle filling in the space between the wing of the atlas and the cervical border of the lower jaw; floored by the larynx held firmly in the fairway of inspiration so that descent of the larynx is inhibited by the stylo-hyoid bones. Thus there is no provision outside the deep tunnel through which pass the larynx and pharynx for expansion of the pharynx during swallowing, &c. This tunnel-space runs into a dome extension in the roof. Down from the auditory tube into the dome of the retropharynx these loose folds of pouches extend themselves into a space, which, to borrow an expressive surgical term, may be termed dead space—a space formed by the developed depth of the jaw. In this space, enveloped by the mucous folds and encased by the submucosa, the superior ganglion of the sympathetic, the vagus, the hypoglossal, the glosso-pharyngeal, the spinal-accessory, the mandibular branch of the fifth nerves and the internal and external carotid arteries are found. These structures would, in this position, be damaged against such bodies as the lip of the articular surface of the atlas and the stylo-hyoid bone were it not that these folds endow the nerves and vessels with the power of passive movement during either co-ordinated or erratic muscular action. So freely do these nerves move in the exquisitely delicate submucosa that some difficulty is met in dissecting the pouches owing to the elusiveness of these structures to the forceps. A very important function of these pouches is the protection of these

basal structures from injury. Without the pouches filling the dead space at the base of the skull (the retropharyngeal area) the grace of movement shown in the head and neck of the horse would be lost. They allow of free extension and flexion of the head, by the looseness of the folds with their delicate submucosa adapting themselves and their contained nerves to every movement so beautifully that nerve pressures or nerve pulls do not arise.

The air contained within these sacs probably plays some minor part in lessening the friction of movement by allowing the mucous surfaces to glide over one another with as little friction as occurs between serous surfaces. The guttural pouches represent tissues modified by force operating through the demands of speed and of food having developed depth and narrowness at the expense of breadth.

Clinical Articles.

ON MR. WALLIS HOARE'S ARTICLE ON MILK FEVER.

By R. FERGUSON STIRLING, M.R.C.V.S.
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I DESIRE to tender my thanks as a country practitioner to Mr. E. Wallis Hoare for the helpful article he has given to your readers—and they should include all country practitioners—on the subject of milk fever. I may state that I always turn to Mr. Hoare's article, when there is one, first of all (that is after the Editorial, of course, Mr. Editor), and I always read his writings with delight, not unmixed with awe; in short, with somewhat of the same feelings with which I listened to his jokes a few years ago as I stood trembling before him, trying in vain to remember whether the horse did or did not possess a posterior aorta, and resolving that if the question were put to me I should venture to suggest that it was a branch of the preplantars. Luckily he did not ask the question. Anyway, however much one may doubt my enjoyment of his jokes on that frosty (?) day in July, none can take from me my delight in his articles. Might I ask him, in the name of all practitioners who are struggling towards the light, to favour us a little more often than he does at present?

There is just one point I should like to raise in connection with

this subject of milk fever, but let me start at the beginning. In the few years I have been in practice I have proved to be one of the most lucky individuals in the results of my milk fever cases. I still hold to the chinosol and air treatment after the manner taught me by my good friend and excellent instructor, Mr. Dawson, of Cavan. Now, when I started in this district I questioned all the people with whom I came into contact as to the prevalence of milk fever; this in order to assure myself that there would be *some* cases I should be able to cure. I was told by the majority of the farmers that most of the neighbouring "vets." used what was either air or oxygen, and also that some of the clients were dissatisfied with the treatment, and for the reason that some of the animals died and others only partially recovered. "Partially recovered" is perhaps a "terminological inexactitude." What I mean is this, that these animals recovered from all the symptoms of milk fever but that some of them developed mammitis, and others of them went "dry"; in fact, never yielded a drop of milk after the injection—two mishaps which, if they were common, would doom any form of treatment in a district such as this is—a milk-exporting district. Now, I never have had a case of mammitis and I never have had a cow go "dry" after treatment. I found, on inquiry, that the cases in which the milk flow ceased were those in which the oxygen treatment had been adopted.

Now, in case I should ever feel tempted to try either the air or oxygen method, perhaps Mr. Hoare, or some other of your readers, could inform us whether my statements, based on hearsay evidence, are in accordance with their experience or no.

Mr. Dawson, who had a very large experience in milk fever, always held that the presence of the antiseptic did away, to a great extent, with the risk of injection, and he told me that he himself had never lost but one case of milk fever and had never had a case of mammitis resulting. I must say, however, that he was most scrupulously clean in his methods and taught his pupils and assistants to be likewise—some of my clients were amazed that, before injection, I should be so particular about the washing of the udder and teats, which, I understand, is not at all a common practice and which, to my mind, is one of those trifling essentials.

I quite realize the storm I may raise about my head by thus

"shoving in my oar" on this subject, for it is one on which the practitioner generally prides himself. Nevertheless, I hope that my effort may encourage other more able pens than mine to write a few notes from their larger experience for our information.

TUBERCULOSIS OF THE LARYNX IN A COW.

BY E. WALLIS HOARE, F.R.C.V.S.,
Cork.

ON September 14, I was asked to prescribe for a cow said to be affected with "snoring" and an occasional cough.

The usual treatment was prescribed, viz., 2 drm. of potassium iodide, to be given twice daily, and a strong blister to be applied to the pharyngeal region. Twelve doses were sent.

On October 17 the animal was said to be slightly improved; the same treatment was continued.

On November 29, improvement slight; same treatment continued.

On December 14 I was requested to attend and examine the cow. The animal was about 8 or 9 years old, and was one of a large dairy. She was due to calve next April, and was in fair condition. When she was made to walk, she emitted a loud roaring sound, and showed marked respiratory distress. While at rest in the field the sound was considerably modified, but when in the stall it was accentuated to a marked extent and continuous. The appetite was good. There was an intermittent cough of a harsh, dry character.

Physical examination of the chest showed marked dulness of the right side up to a certain level, and there was less of respiratory sounds up to this level; above this, sounds of a wheezing character could be heard. Examination of tongue, mouth, and throat did not reveal anything abnormal.

I suggested applying the tuberculin test, but the owner did not think the animal was worth the expense, so he destroyed the cow early in January.

The steward reported "nothing wrong with the chest or lungs," but sent in the larynx which he said contained a "growth."

I forwarded the larynx to Professor Wooldridge, Royal

Veterinary College, London, who kindly examined the specimen and reported as follows:—

"I examined the interesting larynx you forwarded, and find that both vocal cords were tumefied. It was quite impossible to give an opinion as to the nature of the growths until portions were fixed and sections cut and examined microscopically, when typical tubercular histology was revealed. Sir John McFadyean kindly examined the section and confirmed the diagnosis. It would be interesting to know the distribution of the lesions in the subject."

REMARKS.

I regret that I had not an opportunity of conducting the *post-mortem*, as I feel sure that tubercular lesions must have been present in other regions of the body.

The above case is interesting from the clinical aspect, as it shows that tuberculosis, affecting the vocal cords, may be a cause of "snoring" in cattle.

Probably any other tumour in this region would produce similar symptoms.

"Snoring" in cattle is a very common symptom and it is very difficult to give a definite diagnosis in such cases. Is it due to a post-pharyngeal tumour of actinomycotic nature, or of a tubercular nature, or is it due to a tumour in the larynx?—these are some of the questions that arise.

If actinomycotic, the administration of potassium iodide generally, but not always, improves the case, and often brings about a cure.

If tubercular, this drug produces no therapeutical action.

In many of these cases, careful examination of the pharynx fails to reveal the presence of an abscess. What then is the cause of the "snoring" sound?

The tuberculin test will show a reaction if slight lesions be present in any other region of the body, and hence does not prove the pharyngeal lesion to be tubercular.

To decide the matter by administering potassium iodide is too expensive a test, and not always conclusive.

I should welcome some suggestion as to the diagnosis of these conditions. At present I must admit that I am quite "at sea" in the differential diagnosis, and consulting current text-books has only the effect of still further "boxing the compass."

HÆMATURIA DUE TO SARCOMA OF OVARY AND KIDNEY.

By E. H. STENT, M.R.C.V.S.
Manchester.

An aged brown mare, used regularly in a bread van and occasionally for saddle, had occasionally, during the last two years, attacks of hæmaturia, which soon ceased without any treatment. On this occasion, it lasting longer than usual, my advice was sought. The animal was in good condition and general health; the urine contained a large proportion of blood, which soon clotted when caught in a bucket. On examination *per rectum* I was able to feel a very large tumour in the lumbar region, so destruction was decided upon. *Post mortem* revealed a large ovarian tumour, weighing 71 lb., invading the pelvis of left kidney, and which proved on microscopical examination to be sarcomatous.

A CYSTIC CONDITION OF THE SCROTUM.

By Captain E. S. GILLETT, M.R.C.V.S.,
Army Veterinary Corps, India.

Subject.—Australian horse, five years old.

History.—This horse was landed from Australia in December, 1909, and bought as a gelding. On December 1, 1910, a swelling was noticed in his scrotum, which had all the appearance of a testicle; the swelling was only visible at certain times and was not constant.

The horse was cast and his scrotum manipulated. The swelling was found to be fluctuating and the spermatic cord could be distinctly felt and appeared normal; there was a certain amount of thickening of the external coats of the scrotum.

Diagnosis.—I thought it was probably a case of an abnormal testicle which had been retained in the inguinal canal, eventually descending into the scrotum or possibly a case of scrotal hernia.

Operation.—Having chloroformed the horse and carried out the necessary preparation of the surgical field, I made an incision in the same way as if operating on a cryptorchid. After severing the external scrotal coats, I dissected out the balloon-like mass underneath with my fingers, which was firmly connected in places to the scrotal structure, its size being roughly that of an orange.

When freed from its attachments, it was found to be firmly connected at its superior end to the spermatic cord, and manipulation disclosed the fact that the swelling contained fluid. At this stage it was certain that there was no scrotal hernia, but I still surmised it was probably a cystic testicle.

On opening the sac with a scalpel about 1½ oz. of clear, transparent fluid escaped, and on extending the incision and exposing the internal aspect of the sac, I found two cysts about the size of a pigeon's egg firmly attached to the internal lining of the sac. Further search revealed three other ruptured cysts walls from which the contents had escaped, evidently as a result of my previous manipulation. The end of the spermatic cord, which had been severed when the horse had been castrated, was normal. I removed all portions of cyst walls remaining and treated antiseptically. Recovery was uneventful.

FRACTURE OF THE ODONTOID PROCESS IN A RACEHORSE.

By NORMAN MEYERS, L.V.Sc.
Melbourne.

CURRENT veterinary literature does not often contain reference to any break of the second cervical vertebra, implicating the odontoid process, so that a record of a specimen in the Veterinary School of the Melbourne University, which I was fortunate enough to place there, may prove of some interest.

Occurrence.—During the course of a flat race the thoroughbred in reference fell, with disastrous results to himself and rider. Death with the horse was instantaneous, no movement being noticed after he fell.

Post-mortem appearance.—On examination of the systemic vessels, the arteries were found comparatively empty, while the veins, especially those of the splanchnic area, were greatly dilated. The lungs were enlarged and filled with venous blood, but air could be pressed from all parts. Emphysematous areas, often seen in racehorses, were completely absent. The heart, though slightly larger than that of similar animals used for ordinary working purposes, was otherwise quite normal, no degenerated areas being visible. The valves were perfectly sound. As one would expect, the left heart was almost empty and quite free from

clot. The right heart contained clots, but there was no evidence of any agony clot.

Externally the break exhibited itself by a swelling in the region of the axis vertebra, and on being cut down on to it a comminuted fracture of the odontoid process was presented. Fragments of bone were found in the spinal canal and muscular tissue adjacent. Hæmorrhage and laceration of the spinal cord and meninges were apparent.

The *post mortem* was held to elicit whether the cause of death was due to the fracture of the vertebra or if death had preceded that event, but as all the presentations were compatible with those of complete inhibition of the cardiac and respiratory centres, resulting from the injury, I think no doubt will ensue as to the fracture being the immediate cause of death.

HYPERTROPHY AND DILATATION OF THE HEART.

By E. H. STENT, M.R.C.V.S.

Manchester.

An interesting case of the above recently occurred in my practice, the subject being a six-year-old chestnut cob, 14.2 hands high. It had been purchased at a fair, so its previous history was unknown. On being put into harness it would shake its head and sway across the road after travelling a few yards, so was sent to me for an opinion as to the cause.

On examination I found its temperature and the number of respirations to be normal; its pulse was weak, and corresponding heart beats remarkable, the number per minute being only eight, and these occurred in two's, with *a regular* interval of eleven seconds.

I had it under observation for a week, and this condition never varied, except that occasionally it had attacks of dizziness and would fall backwards and after a short struggle get up again. On one occasion I had counted the regular eight beats per minute when, without any excitement or warning, it commenced to beat at a rapid and regular rate (60 to the minute) for about three minutes, when suddenly it threw up its head and fell backwards. After a struggle for a couple of minutes it got up, and the rate of heart beats returned to the eight per minute.

The case being hopeless it was destroyed and a *post mortem* made. All the organs were healthy, except the heart, which weighed 16 lb., and had the usual appearance of a dilated heart: no valvular defects, lungs particularly sound.

Having no previous history, I am at a loss to account for this condition in such a healthy young horse, which was neither a hunter nor racer.

Canine and Feline Clinicale.

SOME OF THE THERAPEUTIC USES OF ACETYL-SALICYLIC ACID IN CANINE PRACTICE.

By ARTHUR PAYNE, F.R.C.V.S.
Weybridge.

ACIDUM acetyl-salicylicum is also known as aspirin, saletin, salacetin acetysol, and xaxa, and has the chemical formula $CH_3CO.O.C_6H_4COOH$.

It is a white powder prepared by the action of acetic anhydride on salicylic acid. Melting point, 135° C. It is soluble about 1 in 400 of water, 1 in 5 alcohol 90 per cent. It passes unchanged through the stomach, decomposing only on reaching the alkaline intestinal juices, and is incompatible with free acids, iron salts, and alkalis. It forms a clear mixture with sodium bicarbonate, and is not intended to be thus prescribed.

Medicinal uses.—This drug has marked anti-rheumatic properties and is used as a substitute for salicylic acid and its salts. It is particularly valuable as it does not irritate mucous membrane of the stomach. It is prescribed in acute and chronic affections of joints, gout, neuralgia, pleurisy, and chorea. For relieving the pain of cancer and cystitis I have found this drug most useful, and in two disorders of the nervous system which a veterinary surgeon with a canine practice often encounters. These in particular are: the paresis following distemper, and the ordinary paralysis of hindquarters, usually found in middle-aged or old dogs. The following are fairly representative cases:—

CASE 1.—A sheep dog, 18 months old, property of a farmer. Treated for distemper and apparently made a recovery in about two weeks. About a week later it exhibited want of power in the hindquarters; as a farm hand aptly described it, "Looks as if

he's drunk." The symptoms developed until he could only just walk, but the slightest false step threw him down.

I commenced with 10 grains of acetyl-salicylic acid morning and evening, and this was continued for a week, with slight improvement; he then received the same dose three times daily. After two weeks of this treatment he had practically recovered; at any rate, I sent another week's supply, but the owner sent the tablets back with a message that the dog did not require them as he was all right.

CASE 2.—Sheep dog, 12 months old. Was treated at his owner's home for distemper, but upon developing lung trouble was sent to our hospital, where he suffered from the most severe attack of broncho-pneumonia I have ever seen a dog recover from—no thanks to medical treatment, as I considered the case hopeless, and left him to our man, who drenched him with milk about four times daily.

He eventually was returned home, apparently cured; but about a week or ten days later we received a message that the dog was getting very weak, and upon my visiting him found the usual symptoms of want of nervous power in the hindquarters. He was not able to get on his hind legs without help, and dragged the toes along the ground as he walked.

The first few days he received 10 grs. morning and evening, and afterwards three times daily. In ten days he was free from any symptoms of weakness in the hindquarters whatever.

CASE 3.—Dachsund, eight years old. Before I was consulted this case had been treated by an unqualified man for about three weeks. When I saw the dog her hindquarters were trailing along the ground, and urine was passed involuntarily. The history I gathered from the owner was that the bitch first showed weakness in the hindquarters, but in three or four days she was apparently completely paralyzed in both limbs.

I first prescribed 5 grs. three times daily, and when I saw her a week later there was a very slight improvement, which was only appreciated by myself and not observable to the owner. The dose was increased to 10 grs. morning and evening, and upon her visit to me the following week she was enabled, with a good deal of balancing, to stand on all four legs. At the end of another week there was a decided improvement, but my client, like the majority of ladies, was impatient and wished to consult

Professor Hobday, but I persuaded her to have a little more patience and wait another week. The bitch eventually made a complete recovery.

CASE 4.—Wire-coated fox-terrier, about seven years old, the property of a working man. The history and symptoms were the same as in Case 3. After two weeks' treatment he showed a decided improvement. At this time I gave the man sufficient 10 gr. tablets to last two weeks, and told him that if the dog did not get well he was to come back and I would refund him his money, but I have not seen him since.

It is impossible to say with any degree of certainty how this drug acts.

In the case of paresis following on distemper, the drug no doubt exerts some influence on the action of the microbic toxines.

In paralysis of the hindquarters, in my opinion it owes its good effects by its antagonistic action to the deleterious substances in the nerves formed by rheumatism, or defective cell metabolism, which intercepts the impulses passing along their nervous path to the muscles.

CHYLOUS ASCITES IN THE CAT.

BY MESSRS. SMYTHE AND SMYTHE, M.R.C.V.S.
Falmouth.

As this disease is of somewhat rare occurrence and the literature concerning it, both veterinary and medical, somewhat scanty, possibly the following clinical details of a case, which we have fortunately been able to follow to the finish, may prove of interest.

The subject was a very fine Persian male cat, about six years of age, whose sole diet for some time had been the flesh of wild rabbits, which he himself poached, preferring this diet to all other obtained for him.

He was brought to us with the history that he had always been a healthy and strong cat, but about six days previously the owner had noticed distension of the abdomen, which gradually increased and seemed to cause some discomfort when moving. Respiration was also slightly inconvenienced, but appetite was quite normal.

Upon examination the abdomen was found to be pendulous, but otherwise the cat was in far better condition than is usually the case when ascites is present.

The treatment recommended was paracentesis abdominis. This was carried out with the result that four pints of transudate were removed, macroscopically presenting the appearance of pure milk. The animal appeared to be relieved by the operation and suffered no inconvenience, the spirits and appetite not being in the least impaired.

On palpation nothing abnormal could be detected. The cat was sent home with instructions that if any renewal of the symptoms occurred it should be returned.

Upon examination of the fluid we found it of alkaline reaction and devoid of smell. It had no reaction with rennet and resisted putrefaction for some considerable time. It did not clot on standing but separated into layers, the uppermost being creamy.

When examined microscopically and compared with milk it was found to be totally different. The fat globules of the latter were absent and were replaced by innumerable fine granules (the molecular base of Gulliver), in reality particles of emulsified fat invested by an albuminous coating.

We forwarded a sample of the fluid to Professor Wooldridge for confirmation, and he agrees with us that it was chyle and has added it as a specimen to the collection in the laboratory of the Royal Veterinary College.

The cat was returned again to us exactly seven weeks after removal of the fluid, again showing some amount of abdominal distension. It was kept under observation for some days, when it was found that on a milk diet the fluid accumulated more rapidly. The animal was then re-tapped and about a pint of fluid removed, presenting exactly the same characters as on the previous occasion. It was then sent home, the subsequent treatment being directed towards maintaining the animal's strength.

For about a month afterwards it continued to do fairly well, then gradually it began to lose its appetite and condition, and at the end of two months it ceased to feed at all, becoming finally so emaciated and weak that it was advised that it should be destroyed.

Upon making a *post-mortem* examination, the body showed marked emaciation with a total absence of fat. Upon opening

the abdomen about a pint of fluid escaped, which appeared like ordinary ascitic fluid mixed with chyle. The thorax contained a small quantity of serous liquid.

The whole of the internal organs presented a contracted appearance, and involving the mesentery and mesenteric glands was a growth which, upon being cut into, was hard, and on microscopical examination proved to be carcinoma.

Therefore it is perfectly clear that the cause of the escape of chyle was due to obstruction to the flow of lymph causing either transudation of chyle through the distended lacteals or rupture of the lacteals themselves—which, we could not determine.

HÆMATURIA CAUSED BY PAPILLOMATA.

By E. H. STENT, M.R.C.V.S.
Manchester.

I WAS asked to make a *post mortem* upon a Great Dane dog that had been found dead one morning in a pool of blood. It had been noticed occasionally that he parted with a little blood in his urine, but little notice had been taken of it.

On *post mortem* I found the bladder was filled with clotted blood and stained serum. On the mucous membrane of the bladder were several warty growths, varying in size from a pea to a marble, and evidently it was from one or more of these the hæmorrhage had occurred. The prostate was enlarged and contained a cavity but no clot. The kidneys were cystic and fibroid, but gave no evidence of being connected with the hæmorrhage.

Abstract and Report.

VETERINARY SCIENCE IN RELATION TO AGRICULTURE.

By W. H. DALRYMPLE, M.R.C.V.S.

Department of Veterinary Science, College of Agriculture, Louisiana State University.

To those who are familiar with the advancement made in the science and art of veterinary medicine and surgery, it is very gratifying, of course, to find that sentiment is undergoing a rapid and radical change, and that our people, all over the country, are fast coming to a realization, and an appreciation, of the value and importance of the veterinary profession, not merely in relieving the sufferings and the infirmities, and in lengthening the period of usefulness of our dumb servitors, but as the conservors of so much of the wealth of the nation invested in its immense flocks and herds; and also, as the conservors of the health of our citizens, whose gastronomic taste is so largely animal as to rank second in the *per capita* amount of meat consumed per annum, on the list of civilized nations of the world.

It has ever been man's sacred duty to preserve in health, or alleviate the sufferings of, those animals indispensable to his existence for the many purposes to which they may be applied, and for which we are told they were expressly created. Looked at from this point of view, it may be said that veterinary science has been cultivated since fabulous antiquity. But although it is said to have been pursued as a science since the time of the ancient Egyptians and Greeks, it was only toward the latter half of the eighteenth century that a few illustrious names could be reckoned who were leading studies along the path of progress and extension. Probably the greatest luminary of that century was Bourgelat, who, about 1761, in Lyons, France, founded the first school. Bourgelat was an eminent lawyer and an able writer; but although learned in philosophy, and reared to the glories of the forum, he abjured the French bar, in order that he might found the school, which was subsequently patronized by royalty, and to which students flocked from every part of France, Germany, Italy, Switzerland, Denmark and Sweden.

Since the founding of the Lyons school, many similar institutions have been established throughout the civilized world. The European schools have become famous, and there is scarcely a country of continental Europe which does not have its one, or more, veterinary colleges supported by the State. England, Scotland and Ireland, too, have their veterinary schools, the Royal Veterinary College in London having been established for nearly 120 years.

Although in point of years, the veterinary profession in America may be said to hardly have doffed its swaddling clothes, yet it has a continental organization, the American Veterinary Medical Association, with a membership of over 1,000 strong, made up of members of the profession from the different States and Territories, colonial possessions and from Canada.

A number of the great universities, such as Pennsylvania, Cornell, &c., have their veterinary departments, or schools, and a great many

of the state universities and agricultural colleges are similarly equipped, and besides these there are several institutions of a more private character that stand high as teaching colleges.

To-day, the demands upon the veterinary profession are both numerous and varied. Besides the call for private practitioners, the national government is constantly seeking thoroughly equipped veterinarians to assist it in controlling and eradicating the different fatal infectious diseases to which our domestic animals are susceptible, and to guard our citizens, and those of other countries, against the dangers of an unsound and unwholesome meat supply. State and local boards of health are acquiring the services of the trained veterinarian to aid them in successfully dealing with the diseases of animals communicable to man. The agricultural colleges throughout the country are employing members of the veterinary profession to instruct their students in the science and art of veterinary hygiene. No agricultural experiment station, to-day, is considered equipped without its veterinary officer, or animal pathologist, to investigate the causes of, and the remedial measures for, the more obscure animal diseases incident to its own State; and the professional aid of the veterinarian is sought after by our national War Department to maintain, in fighting trim, its mounted arm of the service in order to successfully combat a possible foreign foe.

But apart from all this, there is no country in the world which makes any pretensions to successful agriculture, that does not have its full quota of educated veterinarians, both State and as private practitioners, because they are considered essentially necessary to the health and prosperity of the country's great live stock industry, as is the human medical profession to the health of the population. And as we have already mentioned, in conserving the wealth of the country invested in its live stock, the veterinarian is also a conserver of the health of its citizens.

What is agriculture? In the main it may be said to mean the art of raising plants and animals that are best suited for the supply of food for man, and the importance of the maintenance of the health of the live stock in this country, from an economic point of view, and which is chiefly in the hands of the qualified veterinarians to-day, may readily be appreciated when we consider that in 1908, for instance, their number in the aggregate amounted to something like 227,037,000 head.

One of the most important branches of agriculture in this country is the national bureau of animal industry, which not only conducts important investigations with the view of improving the conditions of our animal industry, but has wide powers of inspection and supervision over the health of our live stock; and this national bureau of ours employs over 800 educated members of the veterinary profession.

Coming nearer home, it may be said that the South has been one of the last sections of the country to realize and appreciate the value of veterinary science to agriculture, and for which there has, no doubt, been a reason. In the prosperous period prior to the civil war, veterinary medicine and surgery, as a science, was almost, if not wholly, unknown, and necessarily totally unappreciated in the South, the treatment of the lower animals being in the hands of the ignorant and illiterate "hoss doctor," either white or coloured, who compounded

his nostrums at certain phases of the moon, and was more anxious to ascertain under what condition of the stars the patient was born than to find out the particular condition of its excretory and secretory organs. Since the war, the South has devoted itself almost exclusively to a single-crop-system of farming, with but little or no attention paid to animal husbandry as a part of general farm practice. Outside of the work stock, which generally had to be purchased from outside, the rest of the livestock, such as cattle, sheep and hogs, have been permitted to raise themselves, and with no thought given to their maintenance or improvement. "Root hog or die," seems to have been the slogan, and in consequence, the services of the veterinarian were never once thought of, or if thought of, were considered altogether superfluous, and too expensive a luxury to try to save the life of a razor-back hog, a long-legged, bare-bellied sheep, or a slab-sided scrub steer. In fact the genus "scrub" was conspicuous in all varieties of meat animals upon the farm. Under such circumstances, it may be readily understood how the veterinarian could be looked upon as a totally superfluous individual, or a profession, apparently, without a calling. But now conditions have changed, and still are rapidly changing for the better. "Our friend the enemy," the cotton boll weevil, has impressed the all-cotton planter, at least, with the fact that a single crop of any kind does not spell successful agriculture, but that diversification, including live stock, which has built up and maintained the fertility of the soil, and brought farming up to its highest pitch in other countries, and sections of this country, is the system for him. And why should this not be so in Louisiana, for example, with her incomparably fertile soil, and her immense possibilities in the matter of live stock production especially. Just think of her rich store of valuable by-products from her cotton-oil mills, rice mills, and sugar factories; her abundance of leguminous forage crops, pasture grasses and cereals, and root crops of various kinds which produce with great luxuriance, even after the staple crops have been harvested.

In fact, there is no reasonable excuse for land remaining idle at any season of the year in Louisiana, which places her in the forefront as an ideal section for the production of live stock.

And this fact is fast being realized. Animals of the improved breeds, and of different varieties, are being imported in considerably increasing numbers, to form an important part of general farming by consuming the cheaper food products and manufacturing them into products of greater value in the shape of beef, pork, and mutton, besides producing rich manure to turn back upon the land to add humus to it, and to increase its plant food.

But, with the importation of fine animals, and with increased numbers of them, come also diseases of different kinds, which the stockman cannot successfully combat without the aid of the educated veterinarian. In that little kingdom of Great Britain and Ireland, which has been and is to-day the nursery for the pure bred live stock of the world, there are something like 3,000, or over, veterinarians—members of the Royal College of Veterinary Surgeons—to care for the health of her animals. And so it will be with us in time. The increasing numbers of our farm stock; the improvement of their quality, and their enhanced value, will tend to gradually determine the need of the intelligent advice and assistance of the educated veterinary graduate in our midst.

The veterinary profession in the South has already accomplished a good deal in behalf of agriculture, among which might be mentioned immunization against the hitherto dreaded and fatal Texas fever of cattle; and also has been largely instrumental in obtaining Federal aid for tick eradication; also the introduction of some of the important vaccines, such a anthrax or charbon vaccine, &c., to protect our animals against that fatal scourge, and several Southern members of the profession have brought about economies in the feeding of farm animals that now run up in the millions of dollars; and Louisiana has had her share, and quite a large share at that, in the various accomplishments just noted.

But further, as a matter of mutual protection, both to the live stock interests of the State as well as to itself, the veterinary profession in Louisiana has had created a State law by which no unqualified man may hereafter practise upon the farmer's animals; nor no graduate until he has passed a rigid examination before a State Board of Veterinary Medical Examiners.

And further, members of the profession in Louisiana have been largely responsible for the creation of a State live stock sanitary law to prevent, control and eradicate the contagious and infectious diseases of the farmer's live stock; to prohibit diseased animals being imported into the State from other States, and so afford protection to the live stock branch of his agricultural interests.

These are but few of the benefits which agriculture may derive, and has derived, from veterinary science. The professional veterinarian of to-day is a hygienist as well as a therapeutist. His office is to prevent, as well as to cure, disease; and it is the higher education and more thorough medical training which the modern veterinarian receives in the university, and other well-equipped veterinary schools throughout the country to-day, that makes him a most valuable citizen of the community, and an indispensable factor in the success of our great live stock interests.

Up-to-date agriculture, therefore, and modern veterinary science must go hand in hand; they are inseparable.

(*Gulf States Farmer.*)

VETERINARY WORK IN NEW ZEALAND.

In the annual report of the New Zealand Department of Agriculture for 1910, which we have just received, the section dealing with the work of the "Live Stock and Meat Division" is of especial interest to veterinarians. The director of the division is Mr. C. J. Reakes, M.R.C.V.S., whom we congratulate on having recently obtained the degree of D.V.Sc. from the University of Melbourne. The report shows the wide and varied character of the function of this important division, which comprises all matters relating to live stock generally in health and disease, the control of the quarantine of imported stock, dairy inspection, meat inspection, stock brands, the investigation of animal diseases, for which a special laboratory with a farm attached is

provided, the sterilization at the ports of shipment in India and Australia of all imported animal manures, &c. In addition to the director, the assistant director, and the senior veterinarian stationed at headquarters, there are eight supervising officers, all being qualified veterinary surgeons, whose duties include the investigation of disease, the supervision of the inspections of stock and of town dairies, the furnishing of expert advice and assistance to those officers, the immediate supervision of meat inspection (which is entirely in the hands of departmental officers), and the giving of advice and the rendering of assistance to stock-owners generally.

Although the number of qualified veterinarians employed in the division is very large, there being nearly thirty altogether, "the engagement of more veterinary officers" is considered "necessary during the coming year" in order that more time may be devoted by the staff to field work.

During the year the number of animals slaughtered for human consumption under inspection and the percentage condemned was as follows:—

	Killed	Percentage condemned	Percentage partially condemned
Cattle	216,521 ...	2·21 ...	2·43
Calves	12,844 ...	1·66 ...	0·02
Sheep	2,489,754 ...	0·39 ...	0·09
Lambs	3,637,595 ...	0·06 ...	0·07
Swine	65,153 ...	1·92 ...	5·44

The direct cost of this inspection to the Treasury was but £1,332, this representing the difference between the revenue received from the meat companies and abattoirs, and the gross expenditure.

The division, in addition to the large number of inspectors engaged in the examination of meat, has one of its own officers, Mr. A. Crabb, M.R.C.V.S., stationed in Great Britain, whose duty it is to inspect the meat of the Dominion on its arrival, and "his services have proved of great value to the Department," as is fully borne out by some of Mr. Crabb's communications included in the main report.

One section of the report deals with the examination of stallions for hereditary unsoundness. The system of voluntary examination, initiated in Victoria and adopted in New South Wales and other States, Mr. Reakes does not recommend should be adopted in New Zealand, where the horse-breeding industry is "so valuable an asset"; but, instead, he urges a compulsory system of examination and licensing of stallions, commencing with two-year-olds the first year, gradually extending the scope till all stallions are included up to eight-year-olds, with the provision of an insurance scheme to which the Government should be a contributor.

The necessity of the registration of veterinary surgeons and for shoeing smiths is emphasized in the report. Many other

matters of importance to the farmer, such as tuberculosis, in cattle and poultry, blackleg, contagious mastitis, abortion, facial dermatitis in sheep and cattle, &c., are discussed in the report, which is full of general interest alike to the veterinarian and to the farmer.

The investigations conducted by Mr. H. A. Reid, F.R.C.V.S., D.V.H., included in a special report, are also of great interest, and some of them we propose to reproduce in this journal.

Reviews.

A Minute on Sheep Diseases. A Minute on the Cattle Disease. By R. Willmot, F.R.C.S., Government Veterinary Surgeon, Agricultural and Stock Department, Tasmania.

Two bulletins as above have been received. Each publication is copyrighted, though why such an unusual course is adopted we are at a loss to comprehend.

The two diseases of sheep dealt with are stated to be "braxy" and "louping-ill" respectively. While the report is "intended for the information of those interested in sheep rather than for the bacteriologist or scientist," it is extremely doubtful if it will on the whole be comprehended by the former, and certainly it does not carry any kind of conviction to the latter. Indeed, the phraseology is throughout such a mixture of a semi-popular, semi-scientific nature as to be at times amusing and often annoying. Several phenomena are pathognomonic according to the author: "Some hours before death the abdominal cavity commences to swell up," subcutaneously, "large patches of serous fluid which may be mistaken for blood, but which is not blood but serous fluid stained a bright scarlet colour, due to the escape of the hæmoglobin of the blood corpuscles hæmolyzed by the action of the bacteria." . . . "The fourth stomach contains a certain amount of blood-stained mucus with œdematous patches, more or less tumefaction, and maybe necrosis or gangrene, and the whole organ is stained a purplish colour from the hæmolyzed blood corpuscles." . . . "The small intestines are always empty of fæces (*sic*) and *only* contain gas, mucus, and the pathogenic bacteria." . . . "The lungs may be a little gorged with sanguineous fluid, but in no part of the body is there any evidence of inflammatory action having taken place."

After showing the "blebs or air-blisters" on the surface of the carcase after skinning, the hæmolysis of the blood causing the scarlet tinge of the œdema, the changes in the fourth stomach and the similar appearance, "but in a less degree," of the small intestines, the friable nature of the liver with "a large escape of air" (*sic*) from the cut vessels, the "rush of air" on "opening the heart," &c., to be due to invasion by the bacillus,

it is calmly observed under "Bacteriology of the disease": "From what I have already stated it will be understood that the disease is caused by a special bacillus which leads a parasitic life in the *intestines of the sheep.*" Further on the bacillus is said to be found in nearly all the secretions of a sheep dead of the disease, in the liver, kidneys, and blood; but is "especially abundant in the secretion of the peritoneal and other serous cavities, and in the mucus in the small intestines and fourth stomach." The experimental evidence of the disease being true braxy is practically *nil*, although it is undoubted the description of the *post-mortem* appearances corresponds with that of Hamilton.

Experiments on other animals, even the ordinary laboratory animals, are deemed absolutely unimportant, for apparently none have been attempted. "The results of outside animal inoculations, which are most erratic (why?), are therefore not of much advantage from a diagnostic point of view." This because Dr. Willmot does "not think braxy has ever been accused of affecting animals other than sheep"—verily a new attitude for a bacteriologist to adopt, though perhaps convenient under the circumstances.

That the author has a hazy idea of the meaning of bacteriolysis is shown by the statement that "it may be possible to tell from the phagocytic index of the sheep's blood when it may be safe to drench animals," that is when the *bacteriolytic power* is greatest.

Louping-ill.—A disease identical with louping-ill in Britain is also said to exist in Tasmania, and it does not appear peculiar to Dr. Willmot that to that far-away small land, alone of all the countries to which British sheep have been exported, has this disease been conveyed, while the greater part of Britain has remained entirely free. The symptoms as described are rather suggestive of tetanus.

The *bacteriology* receives considerable attention of a kind. "The natural habitat" of the anaerobic bacillus is "the stomach and intestinal canal of the sheep." It is certainly remarkable in its variations: "Many *involution* forms present prevent an accurate description," but it is "a large rod-shaped bacillus running from 3 to 7 or 8 microns in length by about 1·5 micron in breadth; has a great tendency to spore, which may occur either in the middle or at one end, or it may after incubation assume an appearance like the tetanus bacillus." Truly protean in morphology. The bacillus is cultivated from the peritoneal fluid "which is generally free from other bacilli." (It would be difficult to decide what were "other bacilli.")

"The reproduction of the disease is a simple matter" here, and cultures do not require acetic acid apparently. Curiously though "the *post-mortem* appearance from the artificially-caused disease is different from that of the naturally-acquired disease," chiefly in that there is "a considerable amount of local disturbance and local evidence of the ravages of the bacillus." No data regarding the duration of the natural form of the disease are

given, but from three stages being described—incubative, choreic, and paralytic—one may assume a day or two.

The *Cattle disease* is boldly termed "Chorea paralytica bovis," and the pamphlet claims it to be due to the louping-ill bacillus. According to Dr. Willmot, the description given by Mr. Desmond, of South Australia, of the disease known there as "Dry Bible" corresponds to the cattle disease, especially so far as the choreic symptoms are concerned. The chief symptoms are segregation, uncertain jerky movement, especially of hind limbs, cessation of rumination, some paralysis of the neck muscles and those of mastication and deglutition, and attempts to eat but inability to swallow. Excitement at times is manifested, and there is evident "brain intoxication," followed by paralysis. "Throughout tetanic or choreic twitching of the muscles and limbs may be noticed." The symptoms alone are assumed to show "an extraordinary similarity" with those of "louping-ill" in sheep.

The discovery of the bacillus was made by incubating in pipettes the "clear," "pinkish," and "fairly free from odour" peritoneal fluid of an animal "that had been sick and lying down paralyzed for eight to ten days." It became turbid and "was found to contain the pathogenic micro-organisms, which are rod-shaped bacilli varying in size from 4 to 7 or 8 microns in length by over a micron in breadth, some sporing either in the centre or at one end." These, when compared with those of a similar preparation of louping-ill of sheep, showed "the same morphology, the same involution forms, the same evidence of sporing, the same rounded ends and the same tetanus-shaped forms in some of them," all of which is far from surprising. The same kind of bacteria were obtained from another heifer, but in this case from the stomach and intestine, which "were empty except of mucus and the pathogenic microbe." Accommodating microbe and accommodating stomach!

Although in considering prophylaxis of louping-ill (ovine and bovine) Dr. Willmot favours Hamilton's drenching with cultures, which he assumes is now generally adopted in Britain, yet he rather illogically concludes: "Probably affected cattle now continue to spread the disease exactly in the same way as the sheep do—*e.g.*, through their droppings, which contain the spores of the bacilli contaminating the pastures."

The cattle report is illustrated with reproductions of Hamilton's photomicrographs of braxy and louping-ill bacilli, and photomicrographs of the author's bacilli, and these are indeed far from being convincing. The one of Willmot's showing "drum-stick involution forms and spores" of braxy bacillus is certainly nothing like any of Hamilton's, while the louping-ill photographs might be paralleled by smears from almost any dead animal.

On the whole it is to be regretted that such work, even admittedly rather premature, has been published by a "Government veterinary surgeon," though we are pleased to observe no *veterinary* diploma or degree is claimed by the author.—T. F.

THE REGISTER OF VETERINARY SURGEONS, 1911.

"THE Register of Veterinary Surgeons" for the year is now published at the Royal College of Veterinary Surgeons, 10, Red Lion Square, and the price as usual is three shillings and sixpence. Again we welcome some new features, which include a calendar, giving dates of meeting and examinations, dates of opening of the various colleges, and deaths of famous veterinarians, both British and continental. A list of officers for the year is given, together with a completed list of winners of FitzWygram prizes and a form of bequest. The revised regulations of the Army Veterinary Corps are included, and the new regulations relating to the Territorial force and the special reserve. Another new feature is a list of veterinary societies at home and in the colonies, together with the names of their officers; and, lastly, is to be found a matter of very great importance for those concerned, namely, a list of members whose addresses are unknown. We publish the list elsewhere and direct special attention to it and the possible serious consequences of not informing the Registrar of changes of address. It is interesting to note that during the year there have been ninety-three additions to the register, while sixty-one deaths have been reported during the year. We are very glad to see that at last the telephone has been installed at 10, Red Lion Square, the number being City 1200.

Miscellaneous.

AUSTRALASIAN NOTES.

THE degree of Doctor of Veterinary Science was conferred on Mr. C. J. Reakes, M.R.C.V.S., Director of Live Stock, Wellington, New Zealand, by the University of Melbourne on December 23, 1910.

At the meeting of the Australasian Association for the Advancement of Science, held in Sydney last January, it was decided to establish a new section for veterinary science. As this resolution cannot come into force till the meeting in Hobart in 1915, it was agreed that veterinary science should have a subsection in the agricultural section during the Melbourne meeting of 1912.

Professor J. Douglas Stewart, M.R.C.V.S., Principal of the Sydney University Veterinary School, left Australia at the end of January on a visit to Great Britain and the Continent.

At the Melbourne University in December last, Licentiates in Veterinary Science were granted to Messrs. C. Andrews, L. Bull, R. Grant, G. Heslop, R. Hore, L. L. Manchester, R. F. MacIndoe, T. Philp, F. G. Robertson.

ROYAL COLLEGE OF VETERINARY SURGEONS.

THE following list is abstracted from the new Register of Veterinary Surgeons, and we wish to draw special attention to it.

ADDRESSES WANTED.

The present addresses of the under-mentioned are unknown. The statutory notices have been sent out by the Registrar, and unless an address is received during the year 1911 the names will not be included in the Register for 1912.

Name	Last Address known
Bayes, James	Late of Agriculture Department, Cape Town, South Africa.
Bird, Robert H.	Fort Collins, Colorado.
Brassington, A.	15, Mornington Road, New Cross, S.E.
Cartwright, Robert Heap	98, Gordon Road, Ealing, W.
Casewell, W. Thos.	Newport, Salop.
Clarke, Andrew	Dalserf, Lanarkshire.
Cobbledick, J. O.	Queen's Row, Clifton, Bristol.
Custance, Henry, jun.	Scotgate, Stamford, Lincolnshire.
Davies, Arthur W.	Lennox Taylor Co., Iowa, U.S.A.
Deakin, Herbert Walmsley	109, Welbeck Street, Ashton-under-Lyne, Lancashire.
Dowell, Frank W.	128, Jermyn Street, St. James, S.W.
Farrell, Captain G. H.	Hyderabad (Deccan), India.
Fetherstonhaugh, H. H.	King's Somborne, Stockbridge, Hants.
Garrett, Richard	Buenos Ayres, South America.
Hall, James W.	40, High Street, Harwick.
Jackson, A. F. S.	Johannesburg Turf Club, Johannesburg, South Africa.
Kennedy, W. R.	216, Selhurst Road, South Norwood, S.E.
MacIntyre, James	4, Laird Street, Greenock, N.B.
Mac Laren, John H.	Sweethope, Shawhill Road, Shawlands, Glasgow.
Muirhead, John T.	14, Merchiston Gardens, Edinburgh.
Scott, William	Royal Artillery, Victoria Barracks, Sydney, N.S.W.
Simpkin, F. A.	Grosvenor House, Horncliffe Road, Blackpool.
Smith, T. Assheton	171 and 172, Dhurumtollah, Calcutta.
Smith, Steven Marsh	Late Captain, A.V.C.

Personal.

HUISH—COOPER.—On March 2, at All Saints' Church, Norfolk Square, W., by the Rev. W. Boyd, M.A., Charles Henry, of "Danehurst," Champion Grove, Denmark Hill, S.E., and Red Lion Square, W.C., only son of the late William Huish, of Crewkerne, Somerset, to Ellen Louise (Nell), youngest daughter of the late William Henry Cooper, of Southsea.

Translations.

A PECULIAR CASE OF COLIC.

BY STAFF VETERINARY SURGEON BARTHEL.

THE service horse Saladin, of the 6th Battery of the 4th Regiment of Field Artillery, was under treatment from April 29 to May 20, 1908, with severe colic and stoppage. During the last eight days of this period he had a varying high temperature, which on one occasion rose to over 46° C. Four weeks after the beginning of the illness, whilst emptying the rectum, a short sac was found greatly macerated and filled with dry, unformed masses of dung. Slight sweating and colicky pains of a transient character were shown during the next few months. On April 17, 1909, the horse again fell ill, had become poor in condition and dull in coat. The rectal temperature varied between 38° and 39° C., only once reaching 39·8° C.; the number of pulse-beats varied between 38 and 56; the respirations between 10 and 14. Peristalsis was almost arrested. Organic changes in the intestinal canal could not be established by rectal examinations. Appetite during the whole duration of the illness was considerably diminished. The form of the illness varied continually. On May 17, there appeared to be an improvement in the condition of the patient. In place of the apathy and listlessness Saladin took notice of his surroundings and ate well. On the morning of May 18 the form of the illness had changed much for the worse and at midday the patient died, showing violent pain.

As a cause of death, on section there was found a rupture at the stomach-like widening of the right upper portion of the colon, due to a heavy intestinal stone, as big as a man's head, weighing $2\frac{1}{2}$ kilogrammes ($5\frac{3}{4}$ lb.) Further, the point of the cæcum with the peritoneum on the right side was attached to the right under-surface of the colon by two firm bands of connective tissue.

The situation found on *post mortem* was no doubt due to the long retention of the sac and explained the peculiar course of the attacks of colic. The occurrence of a sac in a horse's intestines is a rare event.

(*Zeitschrift für Veterinarkunde.*)

NINETEEN INTESTINAL STONES IN A HORSE WITHOUT CAUSING COLIC.

BY STAFF VETERINARY SURGEON KLINGBERG.

IN the *Zeitschrift für Veterinarkunde* (1904, vol. 7) I published an article on intestinal concretions and stone colic. At the conclusion of this article I stated: "Almost all large intestinal stones cause colic sooner or later, generally ending fatally. That there may be exceptions is not to be denied, but these are very rare."

Herein I will relate such a case of an exception. A 9-year-old officer's horse fell and caused an incurable sprain of the left hind fetlock joint, so that he was immediately slaughtered. The horse was in a well-nourished condition and had never suffered from digestive

illness. On section, there were found nineteen intestinal stones of different sizes in the stomach-like widening of the colon. Three of the largest examples were each the size of a small fist. Five stones were the size of a hen's egg, six from a pigeon's egg to a walnut, and five as big as hazel-nuts. The surface of the stones was smooth and polished and their form round or oval. Their colour was brownish, streaked with grey. The nineteen stones lay strewn in the fæcal mass, the greater number in the neighbourhood of the under-surface of the intestinal wall. Their specific weight, appearance and surface showed that they were real intestinal stones. This was also shown by an examination of their surfaces when cut in two. The concentric layers were plainly visible. The stones consisted chiefly of phosphates and carbonates. As nucleus in one stone there was a small piece of metal the size of a pea, in another a small stone the same size.

The officer had owned the horse for three years. During this period the animal never had colic. Perhaps the reason for this was that the nineteen stones were strewn in the intestine and separated from each other by fæcal masses. If the larger stones had come together all at one place, sooner or later colic would have arisen.

(*Zeitschrift für Veterinarkunde.*)

Letters and Communications, &c.

Mr. R. F. Stirling; Professor Stapley; Professor J. T. Share Jones; Professor Gofton; Mr. E. W. Hoare; Mr. E. H. Stent; Mr. N. Meyers; Captain Gillett; Professor Leighton; Mr. A. Payne; Mr. R. H. Smythe; Mr. L. E. W. Bevan.

Books and Periodicals, &c., Received.

Meat Inspection and the Meat Industry (Leighton and Douglas, five vols.); Register of the R.C.V.S.; Board of Agriculture; Department of Agriculture for Ireland; Bureau of Animal Industry; Proceedings of the Royal Society of Medicine; Journal of the Royal Army Medical Corps; Bulletin of the Bureau of Sleeping Sickness.

NOTE.—All communications should be addressed to 8, Henrietta Street, Covent Garden, London, W.C. Telephone, 4646 Gerrard. Telegrams, "Baillière, London."

Letters for the JOURNAL, literary contributions, reports, notices, books for review, exchanges, new instruments or materials, and all matter for publication (except advertisements) should be addressed to the Editors.

Manuscript—preferably type-written—should be on one side only of paper, marked with full name of author.

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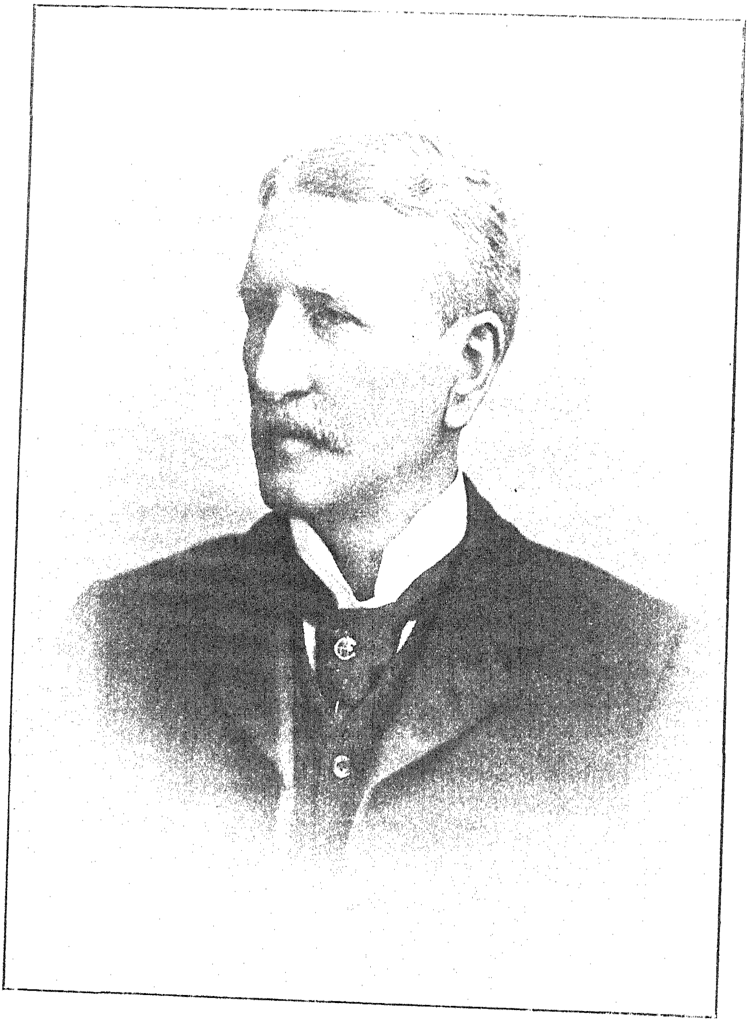

THOMAS DRUMMOND LAMBERT, F.R.C.V.S.
Born 1837.—Died 1911.

THE

VETERINARY JOURNAL

APRIL, 1911.

THOMAS DRUMMOND LAMBERT, F.R.C.V.S.

1837—1911.

MEMBERS of the veterinary profession will be very sorry to hear of the death of Mr. T. D. Lambert, Senior, which occurred at his residence at Rathmines, Dublin, on March 25, in his 74th year. Mr. Lambert's health had been failing ever since he met with a serious accident in May of last year, in which he sustained a broken thigh. He was one of the most prominent and most highly-esteemed members of his profession in Ireland, and his astute professional ability and his general kindliness to all with whom he was brought into contact made him at once respected and beloved by all.

Mr. T. D. Lambert studied at Edinburgh, and in 1859 he obtained the Veterinary Certificate of the Highland Agricultural Society. He graduated as a member of the Royal College of Veterinary Surgeons in 1867. After settling down in practice in Dublin he was elected to his Fellowship in 1877. In 1894 he became a Member of the Council of the Royal College of Veterinary Surgeons, of which body he became a vice-president. He was a very familiar figure at the great horse shows of the Royal Dublin Society, where he officiated as veterinary surgeon ever since 1869. For some years he was veterinary inspector for the Royal Commission on Horse-breeding. He was eight times president of the Veterinary Medical Association of Ireland, and at the time of his death he was a governor of the Royal Veterinary College of Ireland. Mr.

Lambert successively held the appointments of veterinary surgeon to Queen Victoria, to King Edward VII, and to King George V. During the last visit of Edward VII to Ireland, Mr. Lambert was summoned to the Viceregal Lodge, where the late King presented him with a beautiful diamond and ruby scarf-pin. Mr. Lambert frequently took part in the sport of the Turf, running horses for some years at the principal Irish race meetings, while his old grey jumper was for years a prominent figure in the prize lists in the jumping competitions at the Ballsbridge shows.

Mr. Lambert leaves a widow, two daughters, and four sons, two of the latter being members of the same profession which their father adorned.

DEATH OF PROFESSOR ARLOING.

ALL British veterinarians will be very sorry to hear of the death of Prof. Arloing, the famous bacteriologist, and director of the veterinary college at Lyons, which took place on March 21, 1911. We hope to refer to this great scientist again in our next issue.

Editorials.

THE COMMON CHANNEL OF INFECTION IN TUBERCULOSIS.

In this issue of the Veterinary Journal we reproduce a very able address on the above subject by Sir John McFadyean, and we commend it to the very careful perusal of all our readers.

In the olden days tuberculosis was regarded as being almost invariably hereditary in origin. This theory was knocked on the head by the discovery of the *Bacillus tuberculosis* by Koch and the investigations of Bang. Subsequently, based on the common seat of the lesions, inhalation was generally and reasonably regarded as being the principal method of infection. A few years ago, however, Von Behring, Calmette and Guérin and others advanced, and sought to prove, that infection was nearly always by way of the alimentary tract. The evidence for and against these theories is carefully sifted by McFadyean, who concludes that inhalation is the commonest natural method of infection.

This is based partly on the fact that of those cases where the disease affects only one of the two great body cavities 70 per cent. are thoracic, and partly on the results of experiments by which it was shown that inhaled tubercle bacilli would easily induce pulmonary tuberculosis. Moreover it is shown by those experiments that the minimum amount of infective material capable of producing the disease by inspiration is infinitely less than that required to produce the disease by ingestion.

We do not observe, however, that any notice has been taken of the important fact that in the inhalation experiments the material was given in a spray of water, while in natural cases some degree of desiccation of tubercular sputum or expectorate occurs before the infective material is inhaled, and that desiccation and exposure to sunlight both very materially reduce the virulence of the organisms. Hence natural infection is probably not so easy as experimental infection.

Of course it is not denied that thoracic tuberculosis may occur after infection by the alimentary tract, but when it does it is probably always secondary to abdominal tuberculosis. Similarly abdominal tuberculosis may follow primary thoracic tuberculosis either by way of the lymphatics, or by the swallowing of material carried from the lungs into the pharynx.

The main issue, however, must not be missed. In infants and calves the abdominal form of the disease is predominant, and in those cases ingestion is the common method of infection. In adults (men and cattle) tuberculosis is more frequent than in young owing to the greater possibility of exposure to infection, and the primary thoracic form is the most common. Thus it will be seen that infection by either channel is all too frequent, and it behoves us to spare no effort to diminish the chances of infection by either channel.

Sir J. McFadyean's analysis of the available evidence is very opportune, for there was some danger of relaxation of precautions against infection by inhalation, which he regards as the most common channel. It also emphasizes the fact that although the bovine origin of tuberculosis of mankind by ingestion is all too serious, yet danger of infection from human sources by inhalation is even more serious. We must stop the sale of all tuberculous foods, milk and meat, and we should insist on compulsory notification of phthisis so that some form of protection can be instituted against the phthisical patient.

THE VETERINARY SURGEONS ACT (1881) AMENDMENT BILL.

THE above much discussed Bill has been introduced into Parliament. It was presented by Sir Frederick Low, supported by Mr. Hayes Fisher and Captain Jessel, and read a first time. It has been shorn of practically all its contentious matter, and has now three principal sections. The most important, of course, is to institute the payment of an annual fee by Members of the Royal College of Veterinary Surgeons practising in the United Kingdom. The others are to bring existing practitioners under the discipline of the R.C.V.S., and to make companies liable for offences the same as individuals.

The working expenses of the Royal College have for some time exceeded the income, and the invested capital is being drawn upon. Obviously that procedure cannot last long, and we sincerely trust that the Bill will become law. It is ordered to be brought for second reading towards the end of May.

It is gratifying from one point of view to note that some voluntary subscriptions are being forwarded to the Royal College to help to prevent disaster, but although appreciating very highly the sentiments of the donors, the wisdom of the procedure is somewhat doubtful. It

is a striking commentary, however, on the attitude of those who so strongly urged the institution of a voluntary subscription instead of a compulsory one, that their names are conspicuously absent from the subscription list. One would naturally have expected them to be amongst the first to contribute voluntarily. It is a deplorable state of affairs for the body corporate to be reduced to, and we hope it will soon be remedied.

General Articles.

THE COMMON METHOD OF INFECTION IN HUMAN AND BOVINE TUBERCULOSIS.*

By Professor Sir JOHN McFADYEAN, M.B., B.Sc., LL.D., M.R.C.V.S.,

Principal of the Royal Veterinary College, London.

The subject which I have chosen for my address is one about which opinions are still far from unanimous, but I hope to be able to show that the available evidence is sufficient to guide one to a tolerably confident conclusion regarding the matter in dispute.

It is not necessary in this connection to discuss the methods of infection which are on all hands admitted to be comparatively rare, such as infection through the skin or the mucous membrane of the genital tract, or the direct admission of tubercle bacilli into the mammary glands. The matter in dispute is narrowed down to the question of the relative frequency of infection by inhalation and infection by ingestion.

The evidence on which the matter may be decided falls under three heads:—

(1) The most frequent seats of primary lesions in natural cases of tuberculosis.

(2) The relative ease with which animals may be experimentally infected by causing them to inhale or to swallow tubercle bacilli and the distribution of the lesions in animals so infected.

(3) The results of experimental attempts to introduce minute

* The Presidential Address to the Section of Comparative Pathology and Veterinary Hygiene of the Birkenhead Congress of the Royal Institute of Public Health, 1910.

inanimate particles, such as carbon, carmine, &c., into the lungs by inhalation or ingestion (pulmonary anthracosis).

(1) The Most Common Seats of Primary Lesions.

Fortunately the facts in this connection are generally accepted, though opinions are sharply divided regarding the interpretation of them. In cattle and in man it is incontestable that in the great majority of cases of natural tuberculosis the primary lesions are intra-thoracic. Probably in not less than 70 per cent. of the cases in which the disease is still limited to one of the great body cavities in these species, the lesions are confined to the thoracic lymphatic glands or to these and the lungs. It was recognition of this fact which first suggested that inhalation of bacilli must be the common method of infection. The inference appeared to be natural and proper, because, in the absence of evidence to show that bacilli suspended in the respired air could not reach the pulmonary alveoli, the hypothesis was the simplest one capable of accounting for the observed facts. From the time when Koch's researches placed the etiology of tuberculosis on a sound basis until a few years ago, the view that inhalation was the common cause of pulmonary tuberculosis in man and cattle was accordingly the dominant one. In 1903 Von Behring expressed dissent from this opinion, and put forward the view that pulmonary tuberculosis in man is usually the result of intestinal infection and is generally contracted during early life. Two years later Calmette and Guérin espoused Von Behring's suggestion with regard to the common channel of infection, but repudiated the view that the disease which manifests itself during adult life is the belated result of infection during childhood. What may be called the ingestion theory of tuberculous infection undoubtedly owes whatever measure of acceptance it at present enjoys to the writings of Calmette and his school. The reasons which were advanced by them in support of the theory will be examined presently, and at the moment it need only be said that these did not include a denial that the primary macroscopic lesions in cases of natural tuberculosis are in the majority of cases intra-thoracic. That fact is apparently admitted by them, but the view which they endeavour to controvert is that the bacilli which are the cause of primary pulmonary tuberculosis generally reach the lungs directly—that is to say, with the inhaled air.

(2) THE RELATIVE EASE WITH WHICH ANIMALS MAY BE EXPERIMENTALLY INFECTED BY CAUSING THEM TO INHALE OR TO SWALLOW TUBERCLE BACILLI, AND THE DISTRIBUTION OF THE LESIONS IN ANIMALS SO INFECTED.

Before proceeding to examine the evidence under this head it is important to take particular note of the problem which has to be solved. This is necessary because some authors appear to have misapprehended it. As previously stated, it is not disputed that there are many cases in man and animals in which macroscopically distinct tuberculous lesions are found in the lungs and thoracic lymphatic glands without the presence of any such lesions in the abdomen or elsewhere. The question which has now to be discussed, therefore, is not whether intrathoracic lesions can be produced experimentally by feeding, but whether lesions confined to the thoracic organs can be set up experimentally by inhalation or by ingestion.

As far as can be gathered from their writings, Calmette and his school maintain that it is difficult to the point of impossibility to produce pulmonary tuberculosis by causing animals to inhale tubercle bacilli, although they do not appear to have made any considerable number of experiments bearing on the point themselves. In criticizing experiments of that kind by others they suggest that when positive results have been obtained these ought to be ascribed not to bacilli that have reached the pulmonary alveoli directly, but to the more or less accidental deglutition of bacilli during the course of the experiment and subsequent transport of those to the lung by way of the lymphatic vessels after absorption from the intestine. They also describe experiments of which the results are held to prove that it is comparatively easy to infect animals by feeding and to set up a pulmonary tuberculosis in that way.

Although the first paper* published by Calmette and Guérin is headed "The Intestinal Origin of Pulmonary Tuberculosis," the majority of the experiments described in it do not appear to have any bearing on the question which we are now considering—viz., whether a tuberculosis with the visible lesions confined to the thorax can be set up by causing animals to swallow tubercle bacilli. I therefore pass over the experiments in which an attempt was made to infect goats with tubercle bacilli of the

* *Annales de l'Institut Pasteur*, 1905, p. 601.

human and avian types and with Timothy grass bacilli, and I shall summarize only those in which bovine tubercle bacilli were used.

A female goat at an advanced stage of pregnancy was experimentally infected by injecting part of a culture of bovine tubercle bacilli through the teat canals, and when parturition occurred the two kids were allowed to suck the milk from the infected udder. One of them was killed forty-five days after birth, and the *post-mortem* examination revealed intense lymphadenitis involving all the mesenteric glands and those situated along the curvature of the stomach. On section the cortical substance of these glands was found to be crammed with a multitude of small tubercles rich in bacilli. The other glands of the body and the lungs were free from lesions.

The second kid died fifty-one days after birth. Its mother had then been dead for twenty-seven days, and since then it had been fed with the milk of another goat known to be non-tuberculous. The *post-mortem* examination showed lesions similar to those in the first kid—viz., most advanced lymphadenitis of the mesenteric glands, which on section were found to be filled with small firm tubercles, some of them caseous. The other abdominal lymphatic glands, and also the bronchial and retro-pharyngeal glands, were normal, but the lungs were crammed with very young translucent miliary tubercles containing bacilli.

The authors obviously attach great importance to the fact that there were pulmonary lesions in this kid, as the statement is printed in italics. It need hardly be pointed out that in reality this experiment is not of the least value in enabling one to determine whether cases of primary pulmonary tuberculosis are the result of infection by inhalation or not, because in this experimental animal the disease was not confined to the lungs. The experiment therefore not only does not prove that primary pulmonary tuberculosis cannot be produced by inhalation, but it also fails to prove that primary pulmonary tuberculosis can be produced by ingestion.

In the same paper the authors described certain experiments in which they attempted to infect young goats by introducing tubercle bacilli directly into the rumen by means of an œsophageal tube. These young goats were thus infected with tubercle bacilli of the bovine type.

Goat No. 1.—Received on four successive days 50 mg. of culture made into a fine emulsion with 10 c.c. of sterile water, and it was killed thirty-four days afterwards. The *post mortem* showed enlargement of the mesenteric glands, which contained tubercles that were partly caseous. The two lungs were filled with tubercles, and the bronchial glands were greatly enlarged and tuberculous.

Goat No. 2.—Received in the same way on two successive days 50 mg. of culture. It was killed forty-five days afterwards. Here again the mesenteric glands were enlarged and tuberculous, but the lungs and other organs were healthy.

Goat No. 3.—Received in the same way on four successive days 50 mg. of culture. It died seventy-seven days afterwards. The *post mortem* showed great enlargement of the mesenteric glands, which contained caseous tubercles filled with numerous tubercle bacilli. The other lymphatic glands in the abdominal cavity and the liver and spleen were normal. Both lungs were crammed with tubercles, some of which were as large as a pea, and an adhesion had formed between the right lung and the chest wall. The bronchial and mediastinal glands were enormously enlarged and caseous.

Here, again, it must be pointed out that such experiments have no bearing on the question of the intestinal origin of pulmonary tuberculosis. The authors must have entirely misunderstood the position of those who maintain that inhalation is the commonest method of natural infection in human and bovine tuberculosis, and to have thought it necessary to prove what no one has ever denied—viz., that an animal infected with tuberculosis by ingestion may, when it is killed, or when it dies, be found to have intra-thoracic lesions.

The authors then proceed to give an account of similar experiments in which adult goats were employed. In one of these experiments a male goat, aged 2, had administered to it by means of the œsophageal tube on each of four successive days 50 mg. of a culture of tubercle bacilli of the bovine type. The animal was killed sixty-five days afterwards, and the *post mortem* showed that while the mesenteric glands were of normal size they contained some small tubercles calcified in their centres and without stainable bacilli. There were no other visible lesions in the abdominal organs, but the lungs were filled with tubercles in all

stages of evolution, and there were enormous cavities in the pulmonary tissue filled with pus which was rich in tubercle bacilli.

The second goat, aged 3, was similarly infected and killed after fifty days. In this case the mesenteric glands were very slightly enlarged, but sections of them showed small tubercles, caseous at the centre and containing numerous bacilli. The other abdominal viscera were perfectly healthy, but the two lungs contained about thirty tubercles about the size of a hemp seed. The mediastinal, bronchial, and pharyngeal glands were healthy.

The third goat, aged 5, was similarly infected. When it was killed fifty days afterwards the *post mortem* showed slight enlargement of some of the mesenteric glands, and the larger of them contained numerous small tubercles rich in bacilli. The lungs were the seat of a recent tuberculous eruption, the tubercles being small but already beginning to caseate. The bronchial, mediastinal, and pharyngeal glands were healthy.

The first conclusion with which the authors terminate this paper is, that in the immense majority of cases pulmonary tuberculosis is not contracted by inhalation, but by ingestion. This conclusion is based partly on the result of the experiments previously summarized, and partly on a consideration of the manner in which pulmonary anthracosis is produced. What value attaches to these latter considerations will be discussed presently, but in the meantime one need not hesitate to declare that the above experiments conducted by Calmette and Guérin afforded no grounds for abandoning the view previously generally held that inhalation is the common, if not the exclusive, method of infection in cases of primary pulmonary tuberculosis.

These authors returned to the subject during the following year (1906),* and described further experiments in which they infected cattle with bovine tubercle bacilli by means of an œsophageal tube. In introducing an account of these experiments the authors explained that they preferred this method of experimental infection because they had found it difficult to infect animals by causing them to ingest even large quantities of tubercle bacilli in liquid, taken for instance, out of a pail. They account for this difficulty by assuming that the greater part of the liquid thus ingested finds its way into the rumen, where the bacilli became exposed to influences unfavourable to them.

* *Loc. cit.*, 1906, pp. 353 and 609.

They believe that better results can be obtained when the infective liquid is allowed to flow slowly through a tube introduced into the œsophagus, care being taken that the end of the tube does not reach the rumen, and they assume that liquid so administered escapes the first and second stomachs and therefore falls directly into the third, and from that into the fourth stomach. The authors have not furnished any evidence to show that this is the course taken by liquids administered through an œsophageal tube according to their directions, and my own experiments have convinced me that their assumption is entirely erroneous. When coloured liquids are so administered and the animal is killed immediately afterwards one generally finds that not a drop of the liquid has reached the fourth stomach.

Time will not permit me to describe the experiments recorded in the second and third papers by these authors, although they are by no means numerous.

In reality the experiments were too few in number to justify any very sweeping conclusion, but, so far as they go they indicate that the usual result of infection by ingestion is the development of a tuberculosis which primarily involves the mesenteric glands. It is true that some of them showed that when animals are infected by causing them to swallow doses of bacilli that must be considered enormous as compared with those that are commonly in operation in natural circumstances, the disease may become rapidly generalized, with the result that tubercle bacilli or even definite tuberculous lesions may be found in the lungs or thoracic glands within a few weeks after the act of infection. But that falls far short of proof that a tuberculosis with well-defined macroscopic lesions confined to the thorax can be set up by introducing tubercle bacilli into the alimentary canal.

The truth, however, is that Calmette's and Guérin's experiments give only a confused picture of the usual results of experimental tuberculosis determined by ingestion.

The published Reports of the Royal Commission on Tuberculosis contain the records of numerous experiments (which the speaker here summarized) in which calves were infected by causing them to ingest tubercle bacilli, and in no single case were the lesions found at the *post mortem* confined to the thorax. In many they were *confined to the abdomen*, and when thoracic lesions were also present they appeared not to be of older standing than those in the abdomen.

These cases might be supplemented by many others carried out by various experimenters with practically identical results. That, however, appears to be entirely unnecessary in order to convince any unbiassed person that in the case of cattle the almost invariable result of infection by ingestion is a tuberculosis with more or less conspicuous lesions in the abdominal cavity, and especially in the mesenteric glands. Incidentally, the experiments also indicate how difficult it is to set up a rapidly progressive or fatal tuberculosis, even in such highly susceptible subjects as young calves, and with relatively very large doses of bacilli.

As the practically important point to be determined is the common method of infection in cattle and in man (in whom the question cannot be experimentally investigated) the experiments with calves have an importance far transcending those of the same kind which have been carried out with other animals, and the conclusions they warrant when taken by themselves would not be invalidated even if it could be shown that in other species feeding experiments yield different results. As a matter of fact, however, the numerous other experiments with different species which are described in the Reports of the Royal Commission on Tuberculosis had results that are almost completely concordant with those obtained in bovine animals. The only exceptions were a few cases in which dogs fed with bovine tubercle bacilli were found when killed to have pulmonary lesions (usually in the shape of a few small tubercles) without visible disease of any of the abdominal organs. It ought to be noted, however, that dogs, and particularly adult dogs, are highly resistant to infection by ingestion, as proved by the fact that a notable proportion of the feeding experiments carried out by the Royal Commission with animals of that species had entirely negative results. Furthermore, in the majority of the positive cases lesions were present in the abdomen. In view of these facts, and of the results of comparative inhalation and feeding experiments with dogs presently to be described, it will hardly be contended by anyone that the few exceptional results, referred to above, lend any real support to the view that primary pulmonary tuberculosis in cattle or in man is usually the result of infection by ingestion.

Attention may next be called to two papers, one by Findel and the other by Reichenbach, bearing on this question, which emanated from the Hygienic Institute of the University of

Breslau in 1907 and 1908. The authors of these articles (Findel and Reichenbach) carried out researches which were intended to throw further light on the relative importance of infection by inhalation and infection by ingestion in tuberculosis, and the experiments have a peculiar value because they were so designed as to furnish a conclusive answer to the contention of Calmette and others that positive results obtained in animals compelled to inhale tubercle bacilli must be ascribed to accidental deglutition of the bacilli during the experiment. However improbable this suggestion might appear to be, it was impossible to refute it as long as (1) the inhalation experiments were conducted with large unmeasured doses of bacilli, and (2) information was lacking to show the minimum effective dose of bacilli administered by the mouth. Calmette and Guérin not only contended that direct infection of the lungs in inhalation experiments was impossible, but also assumed that comparatively small doses of bacilli were sufficient to ensure infection provided that these were swallowed. In the following experiments account was taken of this assumption by having for each set of animals caused to inhale a measured dose of infective material a control set to which the same dose was administered by the mouth. Immediately this method of experimentation was adopted it became apparent that the minimum effective dose in simple ingestion experiments was immensely greater than the minimum effective dose by inhalation, and as soon as this was established it was easy to show that doses which constantly failed to infect when mixed with the animals' food invariably infected when administered by inhalation in the form of a fine spray. In face of such results the suggestion that infection obtained in inhalation experiments with small doses of material was attributable to bacilli accidentally swallowed absolutely fell to the ground. When, for example, 1 mg. of bacilli mixed with the food failed to infect, while one-hundredth part of the same material administered as a spray invariably yielded positive results, it became ridiculous to suppose that the small proportion of the sprayed material accidentally swallowed should be held accountable for the animal's infection.

Reichenbach's experiments* were carried out with guinea-pigs and goats. In the case of the guinea-pigs the animals had their heads fixed so that they could be exposed to a spray of water

* *Zeitschrift f. Hygiene*, vol. lx., 1908, p. 446.

with which weighed quantities of culture of human tubercle bacilli were mixed so as to form a fine emulsion. The experiments were conducted in the open air, and during the period of exposure to the spray the animals were perfectly quiet and breathed normally.

The control feeding experiments were carried out with human tubercle bacilli from the same source, and again with carefully-weighed quantities of culture thoroughly mixed with a fine carrot pulp. The animals were fasted on the previous day, and they ate the mixture in a short time.

By rubbing up weighed quantities of culture with sterile water Reichenbach prepared a series of emulsions varying in strength. Thus emulsion I contained 5 mg. of bacilli in each cubic centimetre of liquid, and emulsions II, III, and IV were made respectively by diluting emulsion I ten, a hundred, or a thousand times.

It is, of course, impossible to conduct such spray experiments so as to ensure the inhalation of all the tubercle bacilli in the spray, but in comparing the results of inhalation and ingestion it was assumed that this actually happened, and the comparison was therefore altogether in favour of infection by ingestion. The spray apparatus atomized 0.02 c.cm. of fluid in a minute, and in each inhalation experiment the animal was subjected to the spray for ten minutes. Thus, even if none of it were lost, the total quantity inhaled was 0.2 c.cm., and in each control feeding experiment the quantity of the mixture administered was the same —viz., 0.2 c.cm. A calculation showed that 1 mg. of the culture contained 40,000,000 bacilli.

The result of the experiments was as follows:—

Two guinea-pigs which received 5 mg. of culture or 4 million bacilli in spray.—No. 1, killed after thirty-five days. The lungs were filled with tubercles, mostly about the size of a hemp seed, and caseous. The bronchial glands were as large as a hazel-nut and caseous. The mesenteric glands were not enlarged. Tubercle bacilli detected in the spleen by microscopic examination. No. 2 died after fifty-seven days. Severe general tuberculosis of the lungs, liver, and spleen. All the lymphatic glands, including the mesenteric, were much swollen and partly caseous.

Two guinea-pigs fed with the same amount.—No. 1, killed on the twenty-seventh day, healthy. No. 2, killed on the seventy-second day, also healthy.

Guinea-pigs which received .5 *mg., or* 400,000 *bacilli in spray.* —No. 1, killed after fifty-five days. The lungs contained twenty tubercles, of the size of hemp seeds, and mostly caseous. Bronchial glands larger than hazel nuts and caseous. Mesenteric glands not swollen. Tubercle bacilli recognized in the spleen by microscopic examination. No. 2, killed after fifty-seven days. Severe general tuberculosis.

Guinea-pigs fed by the same amount of bacilli.—No. 1 killed after thirty-seven days, and No. 2 killed after one hundred and fifty days. Both healthy.

Guinea-pigs which received .05 *mg. of culture, or* 40,000 *bacilli in spray.*—No. 1, killed after thirty-five days. The lungs contained five tubercles about the size of small peas. Other lesions as in the two previous experiments. No. 2, killed after fifty-seven days. The lungs contained four large and very many small tubercles. Spleen markedly tuberculous. Mesenteric glands swollen.

Guinea-pigs fed with the same amount of material.—No. 1, killed after thirty-seven days, and No. 2 killed after one hundred and fifty days. Both healthy.

Experiment with .005 *mg. of culture, or* 4,000 *bacilli as a dose.* —In this case both the sprayed and the fed guinea-pigs were found to be healthy when killed.

These facts are sufficiently striking, as they appear to prove the much greater certainty of infection by inhalation as compared with infection by ingestion, and make it absolutely impossible to ascribe the tuberculous lesions which were found in the sprayed guinea-pigs to deglutition of the bacilli contained in the spray.

The difference in the susceptibility of the respiratory and digestive tracts was, however, brought out still more forcibly by the fact that in other experiments guinea-pigs which received respectively 14 million and 1.4 million of bacilli by feeding were found to be healthy when killed after fifty-seven days. The smallest dose which was found to produce infection by the mouth was 140 million, whereas, as already stated, infection followed in the case of both the guinea-pigs which received only 40,000 bacilli in the form of spray.

A fact previously mentioned must here be emphasized—viz., that whereas each fed animal consumed the entire dose of bacilli, the sprayed animals could not have inhaled more than a fraction of the same dose.

Reichenbach calculated from his experiments that, even leaving out of account the loss of bacilli from the wind, the smallest infective dose for guinea-pigs by ingestion was 367,500 times greater than the smallest infective dose by inhalation.

Experiments with Goats.—Special importance attaches to Reichenbach's experiments with goats, inasmuch as Calmette laid particular stress on his infection experiments with these animals. The experiments were carried out in much the same way as those above described with guinea-pigs, save that the fed animals sucked the mixture out of a flask. The culture employed in this case was of the bovine type.

The experiments were carried out on April 24, 1907, and thirty-seven days later a goat, which had inhaled 1 mg. of bacilli was killed. The *post-mortem* examination showed the lungs completely filled with tubercles about the size of hemp seeds. At some places, especially in the anterior lobes, the tubercles had become confluent, and some of them showed distinct central caseation. The bronchial lymphatic glands were much swollen. All the other organs were completely normal.

On June 19, or fifty-six days after the beginning of the experiment, two of the sprayed goats and one fed goat were killed. One of the sprayed animals had received 0.1 mg., and the other 0.01 mg. of bacilli, and in both these animals there were pronounced pulmonary lesions. In both cases the lungs were beset with tubercles of the size of a cherry and in great part caseous. In both, the bronchial glands were as large as walnuts and there were calcified places in them. The mesenteric glands were a little larger than normal, but showed no pathological change. All the other organs were completely normal.

The fed goat killed on the same day had received by the mouth 25 mg. of bacilli, and when killed it was found to be healthy, with the exception that one of the bronchial glands was as large as a bean, and the mesenteric glands were decidedly enlarged and showed in their outer part a number of calcified points. Distinct tuberculosis could not be recognized by the naked eye. The microscopic examination of the mesenteric glands revealed the presence of numerous tubercles with caseated and partly calcified centres. At the periphery there were numerous giant cells and some badly staining tubercle bacilli.

A second fed animal which had been given 5 mg. of bacilli by the mouth was killed one hundred and four days after the beginning of the experiment. At the *post-mortem* examination no lesions could be found in any organ save that the mesenteric glands were enlarged and showed a few calcified points. Microscopic examination revealed marked swelling of the lymph follicles but no other alterations.

It is hardly necessary here to emphasize the fact that, whereas only doubtful or inconsiderable lesions were found in the goats which had swallowed respectively 5 and 25 mg. of bacilli, and that in these animals no lesions of any kind were found in the thoracic cavity, severe thoracic lesions were found in the two goats which received by inhalation respectively the tenth and hundredth of a milligramme.

The conclusions drawn by Reichenbach from these and other experiments which space will not permit me to summarize here were as follows:—

In all animals in which tuberculosis can be set up by feeding, infection can be produced more certainly and rapidly, and with much smaller doses, by inhalation. The lesions found in animals subjected to inhalation experiments cannot possibly be ascribed to the accidental swallowing of bacilli during the experiment or to the penetration of the bacilli into the lymphatics of the throat. In so far as any conclusion regarding the method of infection in man can be drawn from animal experiments, the one which ought to be drawn is precisely the opposite to that drawn by Calmette and his co-workers.

Findel* carried out inhalation experiments with a calf and two dogs, which had been tracheotomized some time previously. At the time of the experiments the tracheotomy wound had cicatrized, and the animals inhaled the spray exclusively through the tracheotomy tube.

In the case of the calf the utmost amount of bacilli that the animal could have inhaled during the experiment was 3 mg. of a bovine culture. The animal became very ill, with elevated temperature, on the sixteenth day afterwards, and it had to be killed on the twenty-fifth day. The *post mortem* revealed a miliary tuberculosis of both lungs, the anterior lobes being most affected in each organ. The greyish tubercles varied in size from

* *Zeitschrift f. Hygiene*, vol. lvii., p. 104.

a millet seed to a small pea. The mediastinal and bronchial glands were markedly swollen, but on section showed no recognizable tubercles. The whole of the abdominal organs and glands were perfectly normal.

In the case of the dog experiments calculation showed that:—

No. 1 might have inhaled	·465 mg.	or	16,270,000 bacilli.
,, 2 ,, ,, ,,	·28 ,,	,,	9,800,000 ,,
,, 3 ,, ,, ,,	·141 ,,	,,	4,935,000 ,,

Nos. 1 and 2 were killed thirty-three days afterwards and No. 3 thirty days afterwards.

In No. 1 the *post mortem* showed scattered grey tuberculous nodules throughout both lungs, but most numerous in the anterior lobes. The bronchial glands were not enlarged. The whole of the abdominal organs and glands were normal in appearance, except that there was venous congestion of the liver and kidneys.

In dog No. 2 the whole lung tissue was almost uniformly beset with small grey tubercles, and the bronchial glands were slightly swollen. The liver showed several flat irregular white spots in its peritoneal covering.

In dog No. 3 the lungs showed lesions similar to those in the preceding case. The bronchial glands were swollen and showed a few small yellow centres. The spleen, liver, kidneys, and mesenteric glands were completely normal. Microscopic examination revealed the presence of numerous tubercle bacilli in the lungs and bronchial glands of these animals, but no tubercles or tubercle bacilli were found in the other lymphatic glands examined.

As a control to these inhalation experiments five dogs were fed with culture of bovine tubercle bacilli, the dose being as follows:—

Dog No. 4	... ...	13	mg. or	455,000,000 tubercle bacilli
,, ,, 5	... ...	69	,, ,,	2,415,000,000 ,, ,,
,, ,, 6	... ...	172	,, ,,	6,020,000,000 ,, ,,
,, ,, 7	... ...	4·48	,, ,,	156,000,000 ,, ,,
,, ,, 8	... ...	13·44	,, ,,	470,000,000 ,, ,,

In the case of the last two dogs the full dose was given at one meal, but in the other three it was spread over from twenty to thirty-eight days.

The *post mortem* in each of these cases revealed no distinct tuberculous lesions.

Findel also carried out an extensive series of comparative inhalation and ingestion experiments with guinea-pigs, using in the former experiments an ingenious apparatus invented by himself and Reichenbach, and which enabled one to calculate with a fair measure of probability the actual number of bacilli inhaled by each animal. In these experiments positive results were invariably obtained in the case of animals calculated to have inhaled sixty-two bacilli. A positive result was obtained with two animals which, according to the calculation, had inhaled only twenty bacilli.

As a control to these inhalation experiments fourteen guinea-pigs were fed with doses varying from 19,000 to 312,000, and in no instance was infection produced. Findel, therefore, did not reach the minimum infective dose by feeding in these cases, but his experiments indicated that that was at least 19,000 times greater than the minimum infective dose by inhalation.

The foregoing experiments were carried out with adult guinea-pigs, but the author also made a few experiments with guinea-pigs from three to four weeks old, and obtained infection by inhalation in two animals which were calculated to have received respectively twelve and five bacilli.

Space will not permit me to refer at any length to the other two papers emanating from the Breslau laboratory, and I must content myself with saying that Alexander's* experiments showed the immensely greater susceptibility of rabbits to infection by inhalation than to infection by ingestion, while Heymann† found that it was always possible to demonstrate the presence of tubercle bacilli in the lungs, and sometimes also in the bronchial glands, of guinea-pigs killed from one to twenty-four hours after they had inhaled spray containing tubercle bacilli.

These experiments may be summed up by saying that they prove (1) that, with equal quantities of bacilli, inhalation is a much more certain method of infection than ingestion, and (2) that inhalation of bacilli can, and usually does, determine a tuberculosis which is primarily intra-thoracic.

* *Zeitschrift f. Hygiene*, vol. lx., p. 467.
† *Ibid.*, p. 446.

(3) Pulmonary Anthracosis.

It is a familiar fact that both in men and in animals which have for any considerable period lived in a smoky atmosphere the lung tissue and the bronchial glands are often visibly pigmented with carbon particles.

Prior to the year 1905 it was generally accepted that the pigment was composed of soot particles which had been suspended in the atmosphere and had reached the lung tissue direct with the inhaled air. The pigmentation of the glands was ascribed to the transport of the same soot particles from the lung tissue by way of the lymphatic vessels.

Very little reflection will show that as part of the case put forward by Calmette and others in favour of the intestinal origin of pulmonary tuberculosis it was necessary to show that this view of the genesis of anthracosis of the lungs and bronchial glands was erroneous. At Calmette's suggestion the question was experimentally investigated by Vansteenberghe and Grysez,* and as a result they maintained that the easiest method of producing a typical pulmonary anthracosis in adult guinea-pigs consisted in mixing Chinese ink or carbon powder with their food. They declared that when the animals were killed twenty-four hours after such a repast the pulmonary parenchyma showed disseminated black spots, especially in the upper lobes and along the edges of the lower lobes. In these cases the mesenteric glands were normal, but those of the mediastinum were swollen and black.

They found that when young guinea-pigs were used for experiment the results were completely different, inasmuch as the lungs showed no pigment, while the mesenteric glands were absolutely infiltrated with carbon particles.

In support of their contention that pulmonary anthracosis is due to intestinal absorption of the pigment, they also reported that when the œsophagus had previously been ligatured pigmentation of the lungs could not be produced by causing the animals to inhale a smoky atmosphere except when the experiment was very prolonged.

As was to be expected, these statements attracted much attention, and quite a large number of experiments were soon afterwards carried out by various observers in order to determine

* *Annales de l'Institut Pasteur*, 1905, p. 787.

whether the new view put forward regarding the intestinal origin of pulmonary anthracosis was correct or not. Time will not permit me, nor does it appear necessary, to describe all these latter investigations regarding this question. The following must suffice:—

Beitzke* repeated the experiments of Vansteenberghe and Grysez and obtained diametrically opposite results. He upheld the older view as to the respiratory origin of pulmonary anthracosis, and contended that when the condition was found in animals experimentally fed with carbon mixtures the result was due to aspiration of the mixture during feeding. When precautions were taken to prevent this accident pulmonary anthracosis was never found in the experimental animals.

Kuss and Lobstein† found that it was possible to produce pigmentation of the lungs and bronchial glands by causing animals to inhale carbon for twenty minutes morning and evening for three weeks. In their experiments it was found that when the same quantity of Chinese ink was administered to some animals by inhalation and to others by ingestion only the former showed anthracosis. It is true they found that when massive doses of Chinese ink were introduced directly into the stomach or into the duodenum one might find in the animals killed from twelve to thirty hours afterwards some small sub-pleural points of pigmentation, but in order to produce a condition comparable with natural anthracosis it was necessary to inundate the intestine with Chinese ink.

They therefore concluded that the ordinarily observed anthracosis is ascribable to inhalation and not to deglutition.

Nieuwenhuyse‡ as the result of experiments carried out on eight and twenty-seven guinea-pigs concluded that pulmonary anthracosis is not of intestinal origin.

Arloing and Forgeot§ carried out experiments bearing on this question with guinea-pigs, rabbits, and other animals, which were given by ingestion Chinese ink, charcoal, or pigment from a melanotic tumour in a horse. The animals were killed from six to forty hours afterwards. In no case did they find any anthracosis of the mesenteric glands. They concluded that if such solid

* Reference in *Bulletin de l'Institut Pasteur*, 1907, p. 468.
† *Ibid.*, p. 469.
‡ *Ibid.*, p. 472.
§ *Ibid.*, p. 473.

particles do ever traverse the intestine it can only be in exceptional cases and not under physiological conditions.

Sir William Whitla, who in 1908 delivered the Cavendish Lecture before the West London Medico-Chirurgical Society, chose as the subject of his address the "Etiology of Pulmonary Tuberculosis,"* and sought to show that recent researches had completely overthrown the previously accepted view that inhalation is the common method of infection in man. In the course of his address he outlined the researches of Calmette and Guérin, and Vansteenberghe and Grysez, regarding tuberculosis and pulmonary anthracosis, and adopted the conclusions of these authors with enthusiasm. He characterized the experiments of Calmette and Guérin as epoch-marking, declared that they had shifted the question of the portal of entrance of the tubercle bacillus from the site of the pulmonary alveoli to that of the intestinal epithelium, and prophesied that probably at no distant date it would be accepted that "in the immense majority of cases pulmonary tuberculosis is not contracted by inhalation, but, as taught by Von Behring, the germs enter through the intestinal tract." In support of this view he described certain experiments which he had carried out in conjunction with Professor Symmers regarding the production of pulmonary anthracosis. The results of these experiments were in complete accord with those obtained by Vansteenberghe and Grysez, in that more or less marked pigmentation of the lungs was found in adult guinea-pigs into whose stomachs large quantities of Chinese ink had been introduced even as short a time as four hours before they were killed. In some cases the animals' lungs exhibited "an almost ebony-like blackness."

Before attempting to explain the results of these experiments, it may be observed that even if they admitted of no other explanation than the one put forward by Sir William Whitla—viz., that the carbon particles had reached the lung tissue from the intestine by way of the thoracic duct—they could not be accepted as proof that the tubercle bacilli which cause pulmonary tuberculosis reach the lung by the same route in view of the results obtained by Findel, Reichenbach, Alexander, Heymann, and others, in the experiments to which I have already referred.

It may, however, with some confidence be suggested that

* *British Medical Journal*, 1908, p. 61.

Whitla and Symmers, as well as Vansteenberghe and Grysez, have misinterpreted their results, through failing to take account of certain possibilities of error involved in their method of experimentation.

In the first place it must be noted that they appear to have neglected the possibility that the anthracosis which they found in their experimental animals was spontaneous. The force of this suggestion will appeal to anyone who has paid attention to the frequency with which pulmonary anthracosis is found in healthy adult guinea-pigs. It is true that "almost ebony-like blackness" of the lungs from spontaneous anthracosis is never found in guinea-pigs, and if Whitla and Symmers found such a condition in guinea-pigs which simply ingested food mixed with Chinese ink, I, for one, must declare myself unable to offer any reasonable explanation of the occurrence. At any rate, the authors' explanation cannot be accepted as reasonable, for they admit that in these cases the abdominal lymphatic glands, through which the pigment was supposed to pass, were of "ivory-like whiteness and free from any obvious impregnation with carbon particles!"

But in Whitla and Symmers' experiments some of the animals had the Chinese ink, rubbed up with olive oil and water, introduced into their stomachs by means of a soft india-rubber catheter passed through the mouth, pharynx, and œsophagus. This must be regarded as a dangerous procedure in experiments in which it was necessary to exclude the possibility of direct admission of the pigment-containing liquid into the air passages, and it is therefore quite possible that aspiration of the liquid was the explanation of the ebony-black lungs found in some of the animals.

Probably, however, the main source of error in these experiments was that the authors did not attach sufficient importance to the frequency of spontaneous anthracosis in adult guinea-pigs. This suggestion finds striking support in the fact that the authors were unable to find pigmentation of the lungs when they selected young guinea-pigs. "In ordinary feeding experiments, when the carbon was mixed with the food of these young animals we found usually that neither the glands nor the lungs became visibly infiltrated with carbon particles, the intestinal contents alone being black."

It is unfortunate that Sir William Whitla, in asking the

medical profession in this country to abandon the view that inhalation is the common cause of pulmonary tuberculosis, omitted any reference to the numerous experiments which had already been published at the date of his lecture with results diametrically opposite to those claimed to have been obtained by Calmette and Guérin, and Vansteenberghe and Grysez.

A review of all the experiments which have been carried out in order to determine the mechanism of pulmonary anthracosis will, I think, compel any impartial person to conclude that Vansteenberghe and Grysez's conclusions were founded on error. The older view—viz., that the carbon particles are carried directly into the lung tissue with the inhaled air—has been thoroughly vindicated, and the contention that a degree of pigmentation of the lung tissue and bronchial glands comparable with what is commonly encountered in men and animals can be produced experimentally by feeding with any amount of carbon or Chinese ink, must be considered disproved by the weight of experimental evidence.

In reality, however, any discussion of the route by which the soot particles reach the lungs in natural cases of anthracosis has become quite superfluous when one is considering whether primary pulmonary tuberculosis is caused by the inhalation, or by the ingestion, of tubercle bacilli. It is now absolutely vain to cite the experiments of Vansteenberghe and Grysez, since, as has already been shown, the possibility of producing a direct infection of the lung with tubercle bacilli by inhalation has been absolutely proved.

(4) Conclusions.

Conclusions which appear to be justified after a review of all the available evidence are the following:—

(1) The inhalation of tubercle bacilli suspended in the atmosphere is a very certain method of infection in susceptible animals even when small doses of bacilli are employed.

(2) Experimental infection with tubercle bacilli by way of the alimentary canal is comparatively difficult to realize even in highly susceptible animals, and success is certain only when very large doses of bacilli are administered.

(3) With few exceptions, in animals experimentally infected

with tuberculosis by way of the intestine the primary lesions are intra-abdominal, and the intra-thoracic lesions when present are secondary.

(4) Inhalation is probably the commonest natural method of infection in those species (man and cattle) in which the primary lesions of tuberculosis are usually intra-thoracic.

(5) Naturally-contracted cases of tuberculosis in man or other mammals can be ascribed to infection by ingestion only when the lesions revealed at the *post-mortem* examination are confined to the abdomen, or when the existing abdominal lesions are recognizably older than those present elsewhere in the body.

In formulating these conclusions I have endeavoured to evade the reproach to which Calmette and his supporters have laid themselves open—viz., that of drawing far-reaching inferences from a small number of experiments, and assuming that the results obtained in animals under the conditions realizable in experiments may be immediately applied to explain the method of infection in cases of natural tuberculosis in man. That is why the word "probably" has been introduced into the fourth of the conclusions. The whole of the experimental evidence on which the theory of the intestinal origin of pulmonary tuberculosis in man was built up has been swept away, and valuable new support has been provided for the older inhalation theory, but one ought to avoid the mistake of denying any importance to infection by ingestion either in man or in cattle, or of asserting that tubercle bacilli which enter the body by way of the alimentary canal are never the cause of tuberculosis with lesions apparently primary in the lungs.

ACUTE CONTAGIOUS MASTITIS IN COWS DUE TO THE *BACILLUS LACTIS AEROGENES*.

By J. A. GILRUTH, D.V.Sc., M.R.C.V.S., F.R.S.E., and NORMAN MACDONALD, B.V.Sc.

The Veterinary Research Institute, Melbourne.

So far as we are aware this organism has not hitherto been proved pathogenic for bovines, nor indeed for any animal under conditions other than experimental. The following account of an outbreak of mastitis due to this bacillus as demonstrated experi-

mentally is therefore of interest, more especially as the etiology of acute inflammation of the udder commonly known as "weed," "garget," &c., by dairymen is obscure.

Mr. E. F. J. Bordeaux, G.M.V.C., veterinary surgeon, Melbourne, who was called in by the owner to make an examination of the herd, gives the following account of the history and clinical features of the disease:—

The herd of 40 cows had been milked by a milking machine. According to the owner about 30 out of the 40 cows being milked developed a diseased condition of one or more quarters of the udder. As a result in some lactation had entirely ceased, while others showed one or more dry quarters. All the cows had evinced exactly the same symptoms. There had been no mortality. Two cows had been retained in the milking shed for my examination, and both showed typical acute mastitis.

FIRST COW.—Animal emaciated. The appetite had been very poor but was gradually returning. The udder which had been affected for some time was very firm in consistency and swollen, but not painful to the touch; all quarters were affected. There was but little secretion, all that could be removed being a thick purulent material which was drawn with difficulty from each of the four teats.

SECOND COW.—This animal was in the early stage of the disease. There was general evidence of illness, rumination being suspended, the back arched, and the temperature 105° F. One quarter was tense, firm and painful, being so severely affected as to cause the animal to show lameness on progression. The other three quarters appeared normal, although the milk from each was somewhat curdy.

At the time of my visit the milking machine had been temporarily discarded, the healthy cows were milked by hand, and a sharp look-out was being kept for the appearance of altered secretion from any quarter. I could get no reliable information regarding the origin of the infection. All the cows were said to have been normal prior to the introduction of the milking machine. There had been no cases of milk fever necessitating the use of the milk syphon, which might have induced the first case.

Examination of the milking machine, the teat cups of which I was informed were only washed after each milking with cold

tank water and placed once a week in lime-water overnight, disclosed a very unsatisfactory condition. The cups which had been in daily use were very dirty, one containing a small dried splash of manure. This in itself showed the very careless management and readily accounted for the spread of infection from the original case of the disease.

It will be seen from Mr. Bordeaux's description that from a clinical point of view the cases more resemble "garget" than the ordinary contagious mastitis of a sub-acute character which is due to invasion of the ducts and tubules by streptococci and occasionally by staphylococci.

Specimens of the secretion from the two cases examined by Mr. Bordeaux were secured by him in sterile bottles and brought to the laboratory.

Microscopical examination of these specimens showed the purulent material of the first to be composed of more or less degenerated leucocytes, chiefly polymorphs, some fibrin, and a number of bacilli, gram negative, the majority of which were included within the pus cells. Here and there a free diplococcus could be observed. The second specimen showed a slight deposit consisting of pus cells, but no bacteria could be demonstrated in smears. Agar tubes inoculated with the purulent secretion from the first case developed, in 24 hours at 37° C., colonies, spherical, whitish and about the size of a pin-head. These colonies, which were pure, were composed of short ovoid bacilli, some being almost cocci, non-motile and Gram negative.

The milk from the second case, which was a composite sample from all quarters, after incubation for 24 hours, showed no coagulation, but was found to contain many short bacilli, especially in the "cream," which was largely composed of pus cells more or less affected with fatty degeneration. Agar media inoculated from this developed pure cultures of a bacillus identical with that secured from the first case.

The characters of this bacillus on the various media inoculated need not be detailed. Suffice it to say that they correspond in every particular with those of the *Bacillus lactis aërogenes* as described in all text-books. Further, when compared with the cultural and morphological appearances of a type culture of *Bacillus lactis aerogenes* kindly supplied by the Bureau of Microbiology, Sydney, the two are identical.

Experiments.

Inoculation experiments were conducted on different animals, the result of which showed that while pathogenic for small laboratory animals on subcutaneous injection and for lactating cows on introduction into the galactophorous ducts, the bacillus is non-pathogenic when introduced into the subcutaneous tissue of cattle.

The following are the details of the experiments:—

A young guinea-pig and a young rabbit were each inoculated with 0.5 c.c. of a second subculture. The guinea-pig succumbed in 48 hours, the only abnormality being a hæmorrhagic swelling at the seat of inoculation, in which large numbers of the bacilli were found. Examination of blood, spleen, &c., demonstrated a few bacilli of the same nature as proved by cultivation on artificial media. The rabbit beyond a transitory swelling, which disappeared 48 hours after inoculation, remained apparently normal until the sixth day, when a slight laxative condition of the bowels was observed, the animal being found dead on the morning of the seventh day. *Post-mortem* examination disclosed at site of inoculation a large irregular subcutaneous patch of caseous material, mucosa of large intestine congested, and on peritoneal surface of spleen a few flakes of false membrane, but otherwise no abnormality. Media inoculated from subcutaneous caseous material developed pure cultures of the bacillus.

A calf, two months old, was inoculated with 2 c.c. of the same subculture in the subcutaneous areolar tissue behind the shoulder. The following day the animal was distinctly lame, a puffy swelling with a firm base being present where inoculated. The temperature was but 103.2° F., and the appetite was not diminished. Next day the lameness and swelling had completely disappeared, and the temperature was normal.

Experiments on Cows.

First Cow.—An old animal, calved two months but yielding not more than four quarts of milk per day. 0.5 c.c. of the same culture as employed for the other animals was introduced into the teat-duct of the right posterior quarter, care being taken not to abrade the mucous membrane during the operation. This inoculation was made at 4.30 p.m.

The following morning the animal was visibly ill, the back arched, appetite capricious, and temperature 106° F. The injected quarter was swollen, tense, hot and painful, presenting all the appearances of acute mastitis. The milk secretion from this quarter was greatly diminished, being of the character of whey with curdled clots and a little gas formation. The general symptoms remained as above throughout the day. The following day there was slight improvement in the general condition, and the temperature had fallen to 103.5° F. The quarter, though still swollen, was not so tense or painful. The secretion consisted practically of a cloudy amber-coloured fluid with some purulent flocculi.

The general symptoms of illness soon disappeared, but the

temperature remained about 103° F. for several days. The affected quarter became gradually less tense and painful and gradually hardened in consistency, finally becoming dense and nodular. The uninoculated quarters remained normal in appearance, but the secretion gradually diminished, until when the animal was slaughtered 14 days after inoculation they were dry.

General Examination of Secretion.

While during the first two days after inoculation the bacteria could readily be detected chiefly within leucocytes in the secretion, on subsequent days they were difficult to demonstrate. After the second day the material withdrawn from the inoculated quarter presented the appearance of a translucent amber-coloured serosity with, on standing, a small quantity of purulent deposit, and this character was maintained by the gradually diminishing amount that could be daily extracted till the time of slaughter. The clear serosity rapidly coagulated after withdrawal. It seemed, however, to exercise an inhibitory effect on the development of the bacteria, for although kept in the incubator for days no increase whatever of the organism could be demonstrated. This absence of any increase of the bacilli, and the retention by the straw-coloured serosity of its clear transparent character, suggested the possibility of an ultravisible organism being the real cause of the disease, in spite of the fact that only a subculture had been employed. To test this the serosity was mixed with ordinary broth media in equal parts and filtered through a Chamberland filter. Of the filtrate 5 c.c. was then injected into the left forequarter of another cow in milk. The following day the quarter showed no abnormality, but the milk on standing separated into two zones, the upper (a third of the total) having the appearance of cream and showing on microscopical examination many pus cells but no organisms. No deposit appeared at the bottom of the fluid. This condition had disappeared by the next day, and at no time did the quarter manifest any pathological change or was the general health of the animal affected.

SECOND COW.—Two-year-old heifer in poor condition. Calved ten days but yielding not more than a quart of milk at each milking. Into one quarter was injected 0.1 c.c. of a broth subculture of the bacillus after passage through Cow 1. The following morning the quarter was greatly swollen, hot and painful. The animal showed lameness of the hind limb on the same side. The other quarters were normal. Temperature, 105°. Appetite diminished and back arched. *Secretion* of inoculated quarter: First portion very curdy and flocculent, the remainder being of a whey-like appearance. No gas formation. The following day the quarter was less tense but still hot and painful; lameness less marked; animal feeding better; temperature 102°. The secretion from the affected quarter was very purulent with little clear fluid, the whole having the general character of human tubercular sputum, and being similar to that from the first of Mr. Bordeaux's

cases. On the third day beyond a slight decrease of the tension the quarter and secretion showed no change.

Effect of Inoculation with Blood Serum of Cow 1.

It having become obvious that, as already mentioned, the serosity in the mammary secretion of Cow 1 exerted an inhibitory effect upon the growth of the bacteria, 50 c.c. of blood serum from Cow 1 drawn twelve days after the original inoculation, was injected subcutaneously into Cow 2 on the third day of the experiment. The following day a marked improvement of the diseased quarter was manifested; the consistency was much softer and the size of the quarter diminished. The secretion presented a much less abnormal appearance. At first a few clots of curdy material were removed, this being followed by milk fairly normal in appearance. On standing a small quantity of deposit formed at the bottom, and a thick layer of cream, amongst which were many pus cells, appeared on the surface. It may be here observed that the previous day's secretion in a sterile test-tube which had been at 37° F. meanwhile showed no apparent increase in the bacterial content. The following day the affected quarter was practically normal to appearance and even to manipulation, being only slightly firmer than the other quarters. No clots or flocculi could be detected and no deposit occurred on standing, although the surface cream was unusual in amount and still contained pus cells. A gradual daily improvement was manifested, and by the eighth day after inoculation all abnormality of the quarter and also of the secretion had completely disappeared and no bacilli could be demonstrated. It was fairly evident that the rapid recovery in this case was due to injection of the blood serum from the first cow, but naturally this experiment requires to be controlled by others.

Pathological Changes in the Affected Udder.

On *post-mortem* examination of Cow 1 the uninoculated quarters exhibited no abnormality. The diseased quarter showed much infiltration of the subcutaneous connective tissue with clear œdema. On section the mammary tissue exuded a clear amber-coloured serosity similar to that extracted from the teat. The cut surface was pinkish but mottled throughout with irregular, sharply circumscribed greyish areas, varying in diameter from $\frac{1}{4}$ in. to $1\frac{1}{2}$ in., the largest being situated in the centre of the affected tissue.

Microscopical examination of sections shows the greyish areas to be composed of necrosed tissue in which the nuclei of the cellular elements do not stain with basic dyes. Elsewhere the interstitial tissue and alveoli are distended with fibrinous exudate, the mucous membrane is more or less degenerated, and often the epithelial cells are shed completely, the condition being an interstitial and catarrhal mastitis. Bacilli are fairly numerous, especially within the fibrinous interstitial exudate, but are rarely observed within the ducts or acini.

General.

The observations above recorded indicate the possibility that many of the ordinary sporadic cases of acute mastitis so frequently observed in cows, especially soon after calving and generally attributed to blows, chills, &c., may be due to the *B. lactis aerogenes*, as in the outbreak under review. This bacillus is very common in certain, if not all, dairies, and in our experience is especially associated with piggeries. In other words, it is a common saphrophyte of dairy premises, and so it is not difficult to believe that it may often prove pathogenic when introduced by any means into the lactating udder, especially that of a newly-calved cow.

The milking machine, if not carefully attended to, will undoubtedly, as in this case, readily transfer the disease from udder to udder, just as it so frequently does with the less obvious but none the less serious streptococcic mastitis. No doubt the reason acute forms of mastitis are rarely transferred from cow to cow by the machine or by the hand is because of the painful nature of the affection compelling greater attention on the part of the owner and of the milker.

Summary.

(1) The *B. lactis aerogenes*, while not pathogenic by inoculation into the tissues of cattle, may yet cause acute inflammation if introduced into the lactating udder of cows.

(2) Such an infection may be readily spread by milking machines.

(3) The bacilli after the first few days of infection may be so few as to be overlooked.

(4) The secretion, although originally favourable to the growth of the bacteria, rapidly assumes an inhibitory power.

(5) There is evidence that the blood serum itself rapidly becomes antitoxic.

BNA.

By W. STAPLEY, M.D., D.V.Sc., M.R.C.V.S.,

Professor of Veterinary Anatomy and Surgery in the University of Melbourne, Australia.

"BNA is a shorthand title for a list of some 4,500 anatomical names accepted at Basle in 1895 by the Anatomical Society as the

most suitable designations for the various parts of the human anatomy which are visible to the naked eye."—(*Barker.*)

From 1909 at the Veterinary School of the Melbourne University the BNA naming has been applied to comparative anatomy. The experience thus gained enables a review to be made of the system in its application to veterinary and comparative anatomy. The BNA is a defective system. It is a deplorable fact that as late as the year 1895 a section of human anatomists were taking that narrow view of anatomy that led to the compilation of the BNA. This nomenclature was made without the slightest consideration of the needs of comparative anatomy. By deliberately confining the BNA to human anatomy the system shows the defects of specialization. The exclusion of comparative anatomy from this nomenclature shows the narrow base on which the BNA is built, a base quite inadequate to carry a system of naming suitable for the whole of anatomy. The BNA is not worked out on scientific principles, but by means of the ballot-box, on the principle of "back your fancy." When we reflect on the stupidity of such a plan we are amazed that the BNA system is as good as it is. The members of the congress that voted the BNA into being had imposed on them this restriction: "The terms shall be merely memory signs and need lay no claim to description or to speculative interpretation." This restriction strongly excites the suspicion that thought is an abhorrent process to the manufacturers of names. This restriction is retarding sound thought being given to anatomy as a whole. In spite of this restriction demanding "memory signs," the BNA has failed to produce "memory signs." The BNA introduced nothing, it simply pruned human anatomy of its redundant words. The BNA still uses confusing terms in the *pyramidalis* and *piriformis* muscles. A memory system works different; for instance, it would point out that the *pyramidalis* muscle attains its greatest development in connection with the prepubic bones supporting the marsupial pouch; it would therefore be termed the marsupial muscle, which term would remove all confusion and make the memory of this muscle easy.

The BNA laboriously describes the facial muscles and imposes a tax on the memory of the student that he should not be asked to carry. Comparative anatomy clearly shows that the fanciful names applied to the facial muscles are names applied to a muscle

that splits into numerous strands—*i.e.*, slips of the platysma or panniculus dominated by the seventh nerve and best described under the control of that nerve as the muscles of expression. In the baboon this facial muscle is continuous over the face and forms and surrounds the cheek pouches. With this knowledge the common error of regarding the buccinator as a muscle of mastication cannot arise, nor a mistake occur about its nerve supply, nor any surprise arise from the fact that a horse suffering from paralysis of the seventh nerve quids its food. By ignoring function as a basis of naming structure the BNA threw aside a valuable means of investing anatomy with intellectual interest. Function and structure are most intimately related, and anything tending to divorce anatomy and physiology is against the true interests of these sciences. The BNA name for the superficial gluteal muscle—gluteus maximus—has been adopted against the teaching of function. Evolutionists say that the size of the gluteus maximus of man is due entirely to the erect position. From the weight of anatomical knowledge of gluteal muscles in general, the gluteus medius is the muscle that should be named maximus, if such an objectionable term must be used in anatomy.

Important structures that do not occur in man have no designation in the BNA. The guttural pouches are unnamed, the rumen is nameless. Thus anything but a partial application of the BNA to veterinary anatomy is impossible. Sisson is to be congratulated for making the attempt, in his book "Veterinary Anatomy," to apply the BNA to veterinary anatomy. For the protractor scapulæ of Owen the BNA has no name, and Sisson calls it the omo-transversarius. This muscle is poorly developed in the dog, ox and pig; in the hyæna it is well developed, and is still more developed in the wombat. The point of human, and consequently BNA, interest in this muscle is its great development in primates; the baboon shows the protracting effect of this muscle so strongly on the shoulder that the master stroke in anatomical naming is revealed by Owen's name, *protractor scapulæ.* Further, the weakness of the BNA is revealed in its ignorance of this very important comparative fact.

Condemnation of the BNA is easy and just, but it must not blind us to its merits. Before its advent anatomical naming was chaotic: it has reduced some of the confusion to order. The absence of the clavicle in horses has led to a fusion of the muscles

of this region. We are compelled to adopt the BNA as a basis of comparison, and we are compelled to adopt it in its entirety and to lament its incompleteness, but Sisson has committed an error of anatomical judgment in naming the fused clavicular muscles the mastoido-humeralis; these muscles are all named by the BNA; the word mastoido-humeralis is not a BNA name: it is a hybrid term which leads to confusion. Of confusing terms there is no end in veterinary anatomy. The BNA offers a firm road out of this bog of names, a road rough in places but a road that can be travelled. The muscles composing the mastoido-humeralis of Sisson are all named by the BNA, and they should have been given in this book, which is launched under the flag of the BNA. The BNA is not adopted on reason but on convenience, and at present the adoption of the BNA is the convenient thing. In each succeeding edition of Chaveau more and more mutilation of the original work appeared, until the clearness of this great anatomist became obscured by the alterations of others. The original Chaveau and the BNA have many points in common. The naming of anatomy cannot rest on a purely human basis, but it must be based upon a comprehensive scheme including the whole of anatomy. Meantime we use the BNA because it is the best naming with which we are acquainted.

ASSOCIATION OF VETERINARY OFFICERS OF HEALTH.

The annual meeting of the above Association is to be held in Edinburgh, on October 13, 1911.

The following papers will be contributed: "Tuberculosis and the Milk Supply," by Professor Delépine, Victoria University, Manchester; "Existing and Prospective Legislation *re* Milk Supply," by John Lindsay, Esq., Solicitor and Town Clerk Depute, Glasgow.

The discussion is to be opened by J. S. Lloyd, Esq., F.R.C.V.S., D.V.S.M.Vict., Veterinary Officer of Health, Sheffield.

Members of the profession who hold appointments under the Public Health Acts or the Dairies, Cowsheds, and Milkshops Order are invited to join the Association.

Full information may be had from the Secretary, A. M. Trotter, M.R.C.V.S., Moore Street Abattoir, Glasgow.

Clinical Articles.

USE OF CHLORAL HYDRATE IN FISTULA.

By R. FERGUSON STIRLING, M.R.C.V.S.
Horsley Woodhouse, Derbyshire.

I WONDER if any of your readers have any large experience of the use of chloral hydrate as an external application in fistula?

I had a case a little time ago in which I used it with the following result:—

Subject.—An aged draught mare.

History.—About two and a half years ago she was affected with a fistula on one side of the summit of the withers. She was placed under a surgeon's care and remained under treatment for some months, in consequence of which healing apparently took place. A few weeks later the fistula occurred again in the same place and a second opening also appeared on the other side of the withers.

A quack was now consulted, who appears to have been an expert, not in the way of treating fistula, but in his enviable and magnificent manner of extracting fees. Again the fistulæ were cured (?). Again they recurred, and this time another fee expert, a chemist, was applied to. Again they healed, and yet again they reappeared with renewed vigour. And it was at this stage that the profession was again consulted in the person of myself.

Symptoms.—The withers were much swollen. On either side there were two small openings from which pus was flowing fairly freely. The skin in the neighbourhood was blistered and devoid of hair, partly caused by the discharge and partly, I should think, by the application of some "secret remedy" or other. On probing the fistulæ I found that they each measured about 7½ in. deep and terminated on the superior vertebral spines of the region, which were distinctly rough to the touch of the probe.

Treatment.—Cast mare and curetted bone and fistulæ, the walls of which I found to be very dense and fibrous, so much so that with all my scraping there was practically no bleeding. I then packed the openings with gauze saturated with a 10 per cent. solution of zinc sulphate. I renewed the plugs daily for several days. The tissues responded not at all. I had heard

from a medical friend of the success attending the use of choral hydrate under somewhat similar conditions. He could not inform as to the strength, so I started by using daily plugs with a 5 per cent. solution of this drug. There was only a slight reaction. I then increased the strength to 10 per cent. and the effect was marvellous. On the third day after this the lips of the fistulæ were looking extremely fresh, and on swabbing out the channels there appeared traces of blood on the swabs.

On the sixth day the depth of the fistulæ had decreased by half, but as the walls were becoming very tender and painful and bled readily, I changed back on to zinc sulphate for a day or two. Then as there had been no discharge for nearly a week I completed the cure by means of gauze impregnated with ordinary dry dressing. Time occupied was between five and six weeks.

Remarks.—I must first say that the reason I did not use corrosive sublimate was because I have always objected to the drug on account of the difficulty I have experienced in controlling its action.

I have never heard or read of chloral hydrate being used in veterinary practice for fistulæ, betraying thereby mine own ignorance, mayhap. But still, even although it may be in common use, my experience will perhaps be of some little interest. If it is not in common use then shall I assume a "professorship" and retail the solution in coloured bottles, adorned with labels fearful and wonderful to behold.

SPECIFIC CORONITIS.

By E. S. GILLETT, M.R.C.V.S.

Captain, Army Veterinary Corps, Southern India.

Caulton Reeks, in his excellent work, "Diseases of the Horse's Foot," gives a short account of this disease. During the last eighteen months or so I have come across some fifteen mild cases and four bad ones; it would appear, therefore, that the disease is commoner in India than in England, and as my cases differ considerably from the descriptions given in the above-mentioned book in some important particulars, I append a short account of the disease as I have come across it in India.

Definition.—Caulton Reeks gives the following:—"A chronic

inflammatory condition of the keratogenous membrane, usually confined to that of the coronary cushion, the ergots and the chestnuts, but sometimes extending to that of the frog and sole, characterized by a malsecretion of the affected membrane similar to that observed in canker."

I may here mention that he also gives an excellent illustration of a bad case, and several of my cases were identical in appearance with the one he represents.

I have only met with two cases in which the frog was affected. They were both cases which had been neglected and untreated for months, and in both it was only the bulbous portions of the frog at the heels that were affected.

I have never come across a case in which the ergots, chestnuts or sole were affected; the disease, therefore, appears to run a milder course in India.

I have not seen a case in which thrush existed at the same time.

Symptoms.—The first symptom noticed is probably a scurfy swelled appearance of one or more coronets, the periople at the junction of hair and hoof being absent. The disease appears more usually to affect the fore feet, but may occur in any one limb or in all four at the same time. On examination the coronets will usually be found swollen and sometimes painful; in a case which has escaped notice on account of long hair or neglect the coronet may stand out ¼ in. or even more, and the horn at the junction of foot and hair of coronet appears fissured and wrinkled and devoid of periople. If neglected the coronary cushion becomes seriously affected and the skin covering the coronet becomes under-run, and the hair curls up, and a watery discharge oozes from the affected portions.

On removal of the scaly, proliferated horn a cheesy material somewhat resembling that of canker is observed, but drier, and without the offensive smell associated with that disease. The deeper tissues are moist and may even ooze blood slightly. After successful treatment in slight cases a well-marked "ring" is left on the affected foot, until in the natural course of events it grows out. In more severe cases the hoof is left rough for months and devoid of periople.

In chronic cases the toe of the foot may be shot forward, resembling a laminitic foot.

Cause apparently unknown. Reeks considers the disease to be in all probability the same as canker, but the course of the disease (in this country), especially with regard to its not spreading rapidly, and no inclination to involve the walls of the foot and sole, absence of smell, and the fact that it is far more amenable to treatment, I consider lay this open to serious doubt. *Jowett* ("Blood Serum Therapy") describes a spirochæte as being the cause of both grease and canker, so possibly this disease may be due also to a flagellate. I have examined several specimens by the method advocated by him, but have been unsuccessful in discovering a spirochæte, though, as I have been equally unsuccessful in two canker cases which I examined with the same motive, my non-success may be due to faulty examination.

Predisposing Causes.—As far as my experience goes I know of none. It occurs in the rains, in the dry weather, in stabled horses or horses in paddocks apparently promiscuously. I have seen it in Australians and Arabs, but cannot recollect a case in a country-bred, but this is probably merely a coincidence.

Treatment.—If taken early there is not very much difficulty in effecting a cure. I clip the hair off close round the coronet, scraping off all loose scurf and horn, and then thoroughly disinfect the affected portion, tying on antiseptic swabs, which remain on at least twelve hours. After removal of the swabs the diseased tissues remaining will be found to have a whitish colour of a soapy consistency. This should all be removed carefully with tow or rag, and the coronet again thoroughly washed with soap and water and again disinfected. Finally iodine or iodine ointment well rubbed in should be applied. A month should effect a cure.

Neglected cases give endless trouble, and may last months. I know of one of over eighteen months' standing. As in the case of canker, perseverance and keeping the coronet dry appear the chief essentials to ensure success.

I have found iodine and Stockholm tar made into a thick paste the most serviceable dressing, but success depends on whatever application is favoured being well rubbed in for from ten to fifteen minutes, at least twice daily. Bandages are advisable on the hind legs in order to prevent splashing with urine in the case of geldings; they appear unnecessary in the fore legs.

A LAME CASE.

By G. MAYALL, M.R.C.V.S.
Bolton.

A ROAN gelding, the property of a coal dealer, was brought to me on February 22 with the history that he was all right when left in the stable at night and was found lame in the morning. He could only just put his off hind leg to the ground and could hardly bear any weight on it. I advised fomentations and soothing liniment to the hock joint. On February 24 he was no better and was brought into the infirmary. As he could still bear no weight on the off hind leg, I put him in slings and gave a dose of physic. I had the shoe removed and carefully examined the foot, also the fetlock, and stifle joints, the pelvic bones and hip joint.

When pressed on the inside and lower part of the hock-joint the horse flinched greatly, and when in slings stood on three legs constantly lifting the off hind leg. The hock was blistered three times, but without any good effect, and the animal kept lifting the leg constantly the whole of the time.

On March 18, Mr. Wright, M.R.C.V.S., a partner in the firm of Messrs. John and Alexander Lawson, Manchester, was sent by the company in which the horse was insured, to consult with me. We agreed that he should be destroyed. This was done on March 18. On *post-mortem* examination some effusion was found in the capsule of the hock-joint, but the chief changes were in the astragalus and cuneiform magnum bones.

At the upper third of the groove in the astragalus there was an erosion of the bone about half an inch long and one-eighth of an inch wide, causing a roughened and inflammatory surface for the median articular ridge of the tibia to play on.

The upper surface of the cuneiform magnum had a hole as big as a pea on the inner half of its anterior facet, this cavity extending a third of an inch or more into the substance of the bone. The chief clinical symptoms of the case were the tenderness about the lower inside part of the hock and the never-ceasing lifting up and down of the off hind leg, which was at times carried right up to the abdomen.

LUMBAR PARALYSIS IN A COW.

By G. MAYALL, M.R.C.V.S.
Bolton.

On December 12, 1910, I was called to attend a short-horn cow that was down in the stall and unable to get up on her hind legs. She had fallen away from her stall and been dragged into it by the farmer and his men previous to my arrival.

I emptied her bladder and rectum, blistered her loins, and gave her an opening drench.

On December 13 she was up, but weak on her hind legs, chewing her cud, horns warm, and dew on her nose. Gave her a draught of solution of ammon. carb. and tincture of nux vomica, and she made a complete recovery.

This cow had calved some time previously and there was no sign of milk fever about her. A German writer remarks that under the collective name of "Festliegen der Kühe" one indicates pathological states which do not allow cattle to rise without help. Authors hardly agree on the cause of the malady. Some believe in lumbar paralysis; others like Dieckerhoff in muscular weakness, and Horst-Tempel in lesions of the hock-joint. The latter, to support his own conclusions, says that butchers, when asked about *post-mortem* conditions, say that they find nothing but "a good deal of fluid on section of the hock-joints."

He has treated several cases successfully by enveloping the hind legs from the fetlocks to the hocks in a cloth soaked in Burow's solution and applying over this a woollen bandage, and this serves as a support to a similar enveloping of the hock-joint. His nine cows got up after a few days. *Query.*—Would they have got up sooner if he had blistered the region of the loins and opened the cows' bowels?

ACEPHALIAN MONSTROSITY.

By A. C. DUNCAN, M.R.C.V.S.
Professor in the Royal Agricultural College, Cirencester.

The accompanying photograph shows a type of monstrosity which I think is not common. It is briefly referred to by Fleming in his summary of Gurlt's classification of monstrosities as Class I, Order I, Acephalus.

In this case there were neither fore limbs nor head, the body was only about 4 in. long, but on dissection was found to contain a septum, which represented the diaphragm, and in the anterior cavity a very rudimentary heart and fœtal lungs were found.

The intestines, comparatively well developed, showed a dilatation which evidently represented the stomach.

There was no breach in the continuity of the skin, save the umbilicus.

The ewe which gave birth to the freak was an Exmoor ewe crossed with a Hampshire Down ram. The freak was a twin with a large and well-developed lamb.

METRO-PERITONITIS IN A MARE.

By R. FERGUSON STIRLING.

Horsley Woodhouse, Derbyshire.

Subject.—An aged cart-mare.

History, &c.—February 10, I was summoned about 7 a.m. to attend this mare at a farm about five miles distant. On

arrival I learned that she had been "found foaling" at about 6 o'clock, and that she was about five weeks before her time. Anterior presentation with flexed knee-joints. I removed foal in about twenty minutes and the fœtal membranes followed, looking in a normal condition. The owner informed me that on the last occasion she also aborted, then about two months previous to time. Having given the usual directions, I left the case and promised to look in during the following day.

Symptoms and Treatment.—February 11. Mare looked generally seedy. Temperature 103.4°; pulse quick, but fairly large. I left some of the usual fever mixture and gave directions that she was to be given a pint of oil. The same night I returned to the case and douched the uterus with potassium permanganate solution. At this time the temperature was 104.8° and pulse unchanged.

February 12.—Went to the mare before breakfast and found the temperature had risen to 105.2°. On taking the pulse I was surprised to find that it had that thready character which is associated only with peritonitis. Hastily raising the many rugs with which the owner had covered her, I found it was all too true—abdomen was tense and extremely painful and there was no peristalsis to be heard on auscultation.

I douched the uterus again, and having prescribed the standard powders for peritonitis, viz., p. digitalis, p. nuc vomic, āā ʒss., one every five hours; and having given a guarded prognosis to the owner I departed.

On my return the same day about 9 o'clock p.m., I found that the peritoneal symptoms were intensified. The expression on the face had become haggard, eyes were glazy, abdomen distended so that the middle line was in the same horizontal plane as the hock-joint. Temperature 105°; pulse a wreck. I proceeded to douche as usual and kept on at it for upwards of half an hour, using about ten or twelve gallons of water in the process. Evading an interview with the owner, I crept away. As we drove homewards a medical friend, who was with me at the case, wished to "lay me" all sorts of odds against her recovery, but as it was Sunday, and also perhaps (?) because I thought I might lose, I refrained from taking him up.

February 13, 7 a.m., found me back in the box. Judge my surprise to find the temperature recorded 102°. In my anxiety

I used two thermometers. Pulse still a little quick, but wonderfully improved, both in fulness and general tone; peristalsis restarted and abdomen not painful to touch, though still distended. I douched the mare thoroughly again and left a few more of the powders.

Returning at about 9.30 p.m., I found the condition of the patient still more improved. Temperature was now 101.1°; pulse and respiration normal; abdomen much diminished in size, pain and tension gone. I washed out the uterus as usual, this time with difficulty owing to the closing of the cervix.

February 14: Mare normal, except for considerable weakness, from which she made a rapid recovery.

Remarks.—(1) By dint of constant cross-examination of the owner I discovered, during the case, that he *had* noticed a little white discharge at the vulva after the previous abortion. I take it that the mare was suffering from chronic disease of the Fallopian tubes and that for some unknown reason this condition had been roused from its lethargic state to produce an endometritis—hence the abortion. The disease had then spread to the peritoneum. I take it that the difficult foaling at this abortion, for the mare may have possibly been in labour all during the night of February 10, had encouraged the setting up of these aggravated forms, whilst at the previous and apparently easy abortion the acute symptoms had not been developed, and hence the owner was lulled into security in the idea that the slipping had been the result of accident.

(2) I should like to mention this fact. When I was an assistant I was instructed to use water at a comparatively warm heat for douching purposes. Since I qualified I learned that at the best midwifery hospital in the kingdom, so it is recognized to be, they have introduced the principle of using water at a much higher temperature—at such a temperature that one can hardly put one's hand into it. And I have found that at such a temperature the douching has a much better effect.

(3) I should like to draw attention to the frequency with which the douching was performed—every twelve hours or so. I can imagine some practitioners saying: "Oh, yes, it's all very well, if he had a practice as large as mine he couldn't go running twice a day to a place five miles away." Well, perhaps I could not, but I know that I was as busy as I could well be at

the time and it meant being out of the yard at 6 a.m., and paying the second visit very late at night. But I think the result, which I attribute in great measure to the frequent and thorough flushings of the uterus, fully rewarded me for the extra labour entailed.

(4) It is interesting to notice the quick change from a highly-dangerous condition to one of safety—nine hours.

I record this case in no sense as a smart cure. I simply wish to draw the attention of the junior practitioner, of whom I am one of the least, to the lessons I have learned from it, of which lessons not the least important is this, that one must never give in but persevere in one's efforts, only relaxing them with the advent of the knacker's cart. One never knows, I find, just how much stamina is left and how splendidly the forces of Nature can act when once they are turned in the right direction. "*Vis medicatrix naturæ*" is still the most potent factor in bringing about many a good result.

Canine and Feline Clinicals.

TUBERCULOSIS IN THE DOG.

By E. WALLIS HOARE, F.R.C.V.S.
Cork.

On March 13 an Irish terrier dog, 18 months old, was brought to the infirmary for treatment. The following history was elicited from the owner:—

The dog was never in good condition. Since last December he became gradually thinner. Two weeks ago he appeared sick, and commenced to breathe hard; no cough; loss of appetite, and emaciation were present. Owner thought it was a case of "suppressed" distemper. On examination the following symptoms were present: Emaciation fairly well marked, expression of countenance "*triste*," respirations greatly accelerated and of the "abdominal" type; pulse thready.

Physical Signs.—Percussion: *Right side*, complete dulness, of a "wooden" character. *Left side*, resonance impaired at certain patches.

Auscultation.—Right side, complete absence of respiratory

sounds. *Left side*, respiratory murmurs dull, slight bronchial râles present. *Heart*, no increase in the area of cardiac dulness. Auscultation showed the cardiac sounds to be very weak and indistinct; cardiac impulse almost imperceptible. No cough was present. Muzzle moist.

Diagnosis.—Pleuritic effusion on the right side of thorax, probably tubercular. (A mere guess, based on the view expressed by some authors that nearly all cases of pleuritic effusion in the dog are tubercular.) In view of the long period of pining, destruction was advised.

Autopsy.—*Thorax*: *Right side* distended to its utmost with a straw-coloured fluid. The lung was shrunken and faced up to spine; in fact, it looked as if the lung was absent at first sight. Extensive nodules close to attachments of the diaphragm; other nodules disseminated in the thoracic wall. Diffuse pleuritis. *Left side*, nodules in large amount, especially close to the diaphragm. Diaphragm covered with same. Pleuritis with extensive attachments; no effusion. Diaphragm covered with nodules.

Abdominal Cavity.—A nodular tumour attached to mesentery of ileum. No other lesions found.

Liver showed disseminated white spots.

The lungs, heart, liver, portion of diaphragm, and portion of intestine were forwarded to Professor Wooldridge, Royal Veterinary College, London, who kindly examined them and reported as follows:—

"I examined smears from the enlarged caseating mesenteric gland, from the liver, and from the mediastinal glands, and in each case was able to demonstrate the bacillus tuberculosis. The bacilli, however, were not numerous in any of the preparations."

A CASE OF CHOKING FROM AN UNUSUAL CAUSE.

By E. WALLIS HOARE, F.R.C.V.S.

Cork.

On March 11, a kitten, aged six months, and of small size, was brought to the infirmary with the report that the animal was "choking" for two days, and was only able to swallow small spoonfuls of milk with great difficulty.

On examination a foreign body could be felt in the right side of the neck, about the upper part of the middle third, and in the region of the jugular furrow. When the animal moved the swelling became more prominent and caused distension of the skin.

I cut down on the foreign body and found a sharp point. In applying a forceps a long pin was drawn upwards, but could not be extracted owing to some obstruction at its lower end.

Having drawn it up as far as possible, I dissected away the tissue at the lower end, and extracted what proved to be a lady's hat pin, which measured seven inches in length. The skin wound was sutured and painted over with iodoform collodion. A milk diet was ordered.

On March 14 the animal was brought back, and reported to be doing well, and only showed slight difficulty in swallowing for the first day after operation, but was never anxious for food. The wound was looking healthy, but not healing by first intention. I painted it with iodine.

March 26: Owner reported that wound had healed and animal all right.

Remarks.—This pin must have punctured the œsophagus and found its way to the right side of the neck.

I cannot explain how the bulbous end of the pin was removed from the œsophagus, except that, when withdrawing the pin, the gullet must have been drawn to the right side and incised with the knife. The operation wound was very small, so I did not trouble to explore it, finding that the less handling these wounds get the better.

Probably the more surgical method would have been to cut down on the œsophagus and thus remove the pin.

After-events, however, proved that the method adopted was more successful. Great difficulty would have been experienced in bending the pin back so as to remove it by an incision in the left side of the neck.

I do not think this pin could have been swallowed longer than the period named, as it was not discoloured and no traces of suppuration were present, and it is hardly likely that it would have been aseptic.

PHLEGM IN THE THROAT AND CHRONIC COUGH.

By G. MAYALL, M.R.C.V.S.
Bolton.

An Irish terrier brought to me on February 14 of this year was suffering from a sepulchral cough, which shook his whole frame and was followed by voidance of thick phlegm, in pieces about the size of a shilling.

He was put on to a mixture containing glycero-phosphate of quinine, benzoate of eucalyptol, and benzoate of beechwood creosote, and after consuming two two-ounce bottles of this mixture in half-teaspoonful doses, mixed with water, three times daily, he made an excellent recovery.

A Blenheim spaniel, suffering similarly, also recovered with smaller doses.

Several cases of this description have come under my notice recently, both in the dog and cat, the back of the throat being choked up with thick tenacious mucus and the larger bronchial tubes, too, seeming to be slightly affected.

RUPTURE OF THE KIDNEY IN A CAT.

By A. C. DUNCAN, M.R.C.V.S.
Professor in the Royal Agricultural College, Cirencester.

Subject.—A well-bred Persian cat, about fourteen months old.

History.—The cat was found dead on the morning of February 9, 1911, no previous symptoms having been noticed.

It was said that when a small kitten, about four months old, she had been injured in a doorway, had been treated for spinal injury, and had slowly apparently recovered.

The cat had not been moved from where she was found dead. She was lying on her left side beside a kitchen table. A careful examination revealed no external injuries. On opening the body a small piece of kidney was found on the intestines at the floor of the abdomen.

Further examination showed extensive wasting of intercostal muscles near the attachment of the diaphragm on the left side.

The left kidney, which proved to be subject of fatty degeneration, was ruptured, being in five pieces, one of which was that found on opening the body. The other kidney was normal.

ACUTE RHEUMATISM IN A FOX-TERRIER.

By G. MAYALL, M.R.C.V.S.
Bolton.

A ROUGH-HAIRED fox-terrier, four years old, was brought in on March 10, of this year, suffering from stiffness all round and crying out with pain when his off hind leg was touched. From the 10th to the 13th he was unable to rise without assistance, and his hind legs especially seemed to fail him. He was put on to a diet of barley water and milk and five grains of aspirin given to him three times daily.

He made a complete recovery and from a doleful and disconsolate state on March 10, was discharged gay and lively on March 17.

Abstracts.

FOWL SPIROCHÆTOSIS.

By WALTER JOWETT, F.R.C.V.S., D.V.H.Liv.
Veterinary Department, Cape Town.

THE object of the present note is to record the occurrence in the vicinity of Cape Town of a fowl disease known as "Spirochætosis." This is a tick-borne malady, the causal agent being a protozoal parasite—a small spirally formed thread-like organism, found in the blood of infected subjects.

In many parts of the Cape Province chicken-rearing is attended with a certain amount of difficulty; year after year, it has been reported, young birds die after exhibiting somewhat vague symptoms—the more noticeable being either diarrhœa or paralysis, and more or less wasting. In some instances no symptoms whatever seem to have been observed by the owner, merely the birds succumbed one after another without evident cause.

In some of these outbreaks which we have investigated we have attributed the cause of the mortality to a small (microscopic) parasite, known as a coccidium, which we have found present in the intestinal tract in the epithelial cells of the lining membrane as well as free in the contents.*

Larger intestinal parasites ("worms") are also exceedingly common, and these undoubtedly do a certain amount of harm to their hosts, especially if these be young or weakly subjects. Fowl cholera, again, is not infrequently met with, and the same

* We have encountered a coccidium (*C. cuniculi*) in the liver and intestines of rabbits in Capetown, the parasite producing a fatal disease in these animals. In pigeons also, on at least two occasions, we have seen coccidia in the intestines.

applies to another disease of fowls, namely, avian diphtheria. Both these diseases are formidable, the first mentioned especially so, entailing, as it does, a very heavy mortality, as many local fowl-owners know to their cost.

But occasionally one has examined the carcases of fowls in which none of the parasites or diseases we have mentioned were in evidence. One found that the birds were anæmic, in some cases wasted, occasionally enlargement of the spleen was noticeable, but other marked alterations of the organs were conspicuous by their absence.

Attempts to cultivate any specific bacteria which it was thought might be present in the blood or organs generally proved fruitless. In some such cases the owners attributed the cause of the mortality to the attacks of the fowl tick (or to the "tampan," as it is commonly termed here)—an opinion with which we, in many instances agreed, and certainly on adopting measures to eliminate the ticks from the premises the mortality often promptly ceased.

Fowl-owners are well aware of the harm which the fowl tick is capable of causing their birds, but they attribute the deleterious effect excited by these arthropods solely to the blood which the latter abstract from the chickens at each meal. There can be no doubt that in consequence of a heavy infestation with ticks, young or weakly chickens may be killed outright by such means, assisted perhaps by a toxic and hæmolytic substance which the tick introduces into its host when feeding on the latter.

But we have long suspected that the real cause of the mortality in some of these cases was a parasite which the tick transmitted to the fowl—a parasite similar to or identical with the spirochæte found in geese in Transcaucasia in 1891, and subsequently in fowls first in Brazil in 1903, and later by various observers in many other parts of the world, India, the Anglo-Egyptian, Soudan, Cyprus, Australia, Rhodesia, Martinique, &c., &c.

We have been constantly on the look out for the parasite in this country, but it is only recently that one has been enabled definitely to demonstrate its presence in the blood of fowls in the Cape Peninsula. From time to time fowls have been forwarded to the Veterinary Department, the owners being anxious to ascertain the cause of the death of their birds. In almost every instance, however, only dead fowls were forwarded, and these usually did not arrive until several hours after life was extinct. It so happens that in the disease now under consideration, although the causal parasite (spirochæte) may be numerously present in the blood during the fever period at the early part of the infection, if it has not already disappeared when death occurs (and this often happens) it is a difficult matter to demonstrate its presence some hours after that event.

The Government Entomologist (Mr. Lounsbury), like ourselves, has long suspected that the fowl tick possibly transmitted a parasite here amongst poultry, and that a disease probably existed in this country similar to the fowl spirochætosis of

Brazil. Recently, this gentleman had occasion to visit an estate on which young chickens were dying in considerable numbers, and in view of his suspicions he procured two living but obviously sick chickens, and these he very kindly forwarded to the writer for the purpose of investigation. On microscopical examination of the blood of one of these chickens free spirochæte were found present, while in both certain bodies were observed in the red blood corpuscles—bodies which are believed to result from the penetration of the parasite (spirochætes) into the erythrocytes.

From these chickens, and from others subsequently obtained from the same estate, the disease has been transmitted to other healthy chickens at the Rosebank Experimental Station for the purpose of further study.

The experimental work now in progress is still incomplete. In the present instance it is intended merely to give a brief outline of the nature of the disease and of the parasite which causes it together with certain recommendations for dealing with the malady. By so bringing the existence of the disease to the notice of fowl-owners, one hopes as a result to gain an idea as to the prevalence of fowl spirochætosis in the Cape Province. So far, as already mentioned, we have met with but one outbreak, but one inclines to the belief that the disease may have a fairly wide distribution in South Africa. For some time its existence has been known in Rhodesia. This appears to be the first occasion on which the disease has been met with south of that Colony. At any rate, one is safe in asserting that it has not been described previously from the Cape Province.

Description of the Pathogenic Agent.

In the blood of the naturally infected chickens we have found —existing either together or separately:—

(1) Free spirochætæ and

(2) Rounded "bodies" in the interior of the erythrocytes.

It will be convenient to describe these separately.

(1)—The Free Spirochætæ.

The spirochæte is a delicate, extremely thin, thread-like, spirally formed (or corkscrew shaped) organism. Its body is of uniform thickness, except at the extremities, when it tapers gradually to a point.

Examined in the fresh state, the organism is found to be very actively motile. In fixed and stained preparations, the parasites are seen to vary greatly in size. Short forms are encountered, measuring 8 or 9 microns with 3 or 4 spiral turns; others—and these are more commonly encountered—measure 16 or 17 microns and possess 7, 8, or 9 spirals. Even larger spirochætæ are occasionally encountered measuring 20 to 25, and, in a few instances, 30 microns. In the case of these long forms, however, it is sometimes rather difficult to determine whether they are really constituted of but one parasite or of two joined end to end.

Depending much, apparently, upon the position assumed by the parasite during the process of fixation (previous to staining), it may appear (1) as a regular and beautifully formed spiral, or (2) it may be looped in a circle, figure of eight pattern, or in fact, assume any form one might imagine possible with a long, extremely flexible, delicate, ribbon-shaped body, such as is possessed by this parasite.

Frequently two spirochætæ are seen joined end to end. Whilst it is not unusual to see two spirochætæ lying close against each other—approximated at one extremity, the others diverging at an acute angle—this is believed to represent a stage in the (longitudinal) division of the parasite. At certain stages of the infection spirochætes may be seen in which a number of transversely arranged unstained areas are present. Collections of the organisms in more or less intricately arranged and interwoven "tangles" or "clumps" are quite frequently seen; this phenomenon is not observed at the commencement of the infection when the parasites are still scanty in the blood. Later, however, when they have increased in numbers, it is not uncommon for the spirochætes to form clumps and afterwards to disappear from the blood stream—this is the so-called "crisis." Thereafter the spirochætes may not again appear in the blood in numbers sufficient to be demonstrated by ordinary microscopic examination, and still the subject may die, although the parasite cannot be detected in its blood. On the other hand, in some of our experimental cases in *young* chickens, the parasites have increased progressively in numbers until death. In any case, however, they usually disappear somewhat speedily after that event.

(2)—Intra-Corpuscular Bodies.

We have encountered the bodies now to be described in naturally, as well as in experimentally infected subjects. They may co-exist with the free spirochætes already described; they may appear before the latter or on the other hand may not be seen until after the spirochætal crisis, *i.e.*, until the free spirochætes have disappeared from the blood.

Bodies similar to these in the interior of the red blood corpuscles of the fowl were first described by Dr. Balfour in the the Anglo-Egyptian Soudan. This investigator at first considered that the intra-corpuscular bodies represented probably a parasite separate and distinct from the free spirochætæ, but as a result of extended observation he concluded that they represent "a definite stage in the life history of the parasite (spirochæte). As Prowazek says," Balfour observes, "it may be a true resting stage." Balfour is inclined to think this intracorpuscular stage in the life cycle of the spirochæte provides for re-infection. He considers that "the tiny granules into which the nitra-corpuscular forms break up may possibly be of a spore nature.

Galli-Valerio studied fowl spirochætosis in Tunis, and he, as well as Bouet, who studied a similar disease of fowls in the

French Soudan, met with intra-corpuscular bodies as well as with free spirochætæ in the blood of the infected birds. The first-mentioned worker looks upon the North African disease (fowl spirochætosis) as distinct from that met with in Brazil, and due probably to a different species of spirochæte. He believes the Tunisian spirochætosis to be the same as that found in the Anglo-Egyptian Soudan by Balfour. Dschunkowsky and Luhs, it may be mentioned, have found similar intra-corpuscular bodies in fowls in Transcaucasia—the same have also been seen in geese in spirochætosis.

With regard to these intra-corpuscular bodies, Galli-Valerio is doubtful what interpretation to put upon them, but he thinks (says Balfour, who quotes this investigator) "it is a question of a feeble infection passing into a chronic state."

The intra-corpuscular bodies we have encountered in the Cape Town chickens correspond very closely indeed with those figured by Balfour with this one difference—in the Anglo-Egyptian Soudan, apparently, as many as seven "bodies" may be found in one red blood cell—here we have never yet seen more than four bodies in one erythrocyte. One and two bodies are the numbers usually observed in one erythrocyte—only occasionally are three or four encountered in any one cell.

These "bodies" are usually rounded in form and invariably are situated in the extra-nuclear portion of the erythrocyte. They are perhaps more often found at the end of a cell than in any other position, still it is not rare to see them laterally placed. They may be situated quite close to the edge of the nucleus, or on the other hand, may border the periphery of the cell. Very frequently they occupy a mid-way position.

The young recently-formed bodies are uniformly stained (dark red or purple with Romanowsky stains—the chromatin staining reaction in fact) throughout. Other bodies appear only partially stained, a portion of the body being purple coloured, the remainder unstained.

Still others of the "bodies" are stained only at the periphery, the remainder (the interior) of the "body" being entirely unstained. Finally others are stained at the periphery, and enclose a number of granules ("Sporulation forms").

Occasionally we have encountered a blood corpuscle containing a collection of these granules unenclosed, apparently, by any peripherally stained ring or capsule—this phenomenon, however, is rare.

In size the bodies vary—the smallest measure 1 micron, or considerably less, whilst the largest may attain in measurement a diameter of 4 microns.

As already mentioned the two forms of parasite (free spirochætes and intra-corpuscular bodies) may occur either together or separately in naturally infected fowls. In such subjects, therefore, one may observe:—

(1) Free spirochætæ alone.
(2) Both free spirochætæ and intra-corpuscular bodies.
(3) Intra-corpuscular bodies alone.

It seems that the free spirochætes may first appear and that the intra-corpuscular bodies may or may not make their appearance later or *vice versa*.

The other blood changes usually associated with the presence of the parasites are polychromasia, vacuolation of the cells (especially of the leucocytes) and in short the general blood changes one associates with anæmia.

Inoculability of the Parasite.

We have endeavoured to transmit the spirochæte by inoculation of blood containing it into (1) pigeons and (2) a young white rat. In neither case did the experiment succeed.

The parasite is readily inoculable into young chickens (and into *susceptible* adult fowls). Passing from chicken to chicken by experimental inoculation, the organism seems at first to increase in virulence, later, however, it diminishes in this respect. As other observers have pointed out the disease cannot be indefinitely transmitted from fowl to fowl by experimental inoculation of blood containing it—at any rate, not in fatal form. To retain its degree of pathogenicity passage through the tick becomes essential sooner or later.

Identity of the Parasite.

The spirochætæ so far discovered in the blood of domestic birds are:—

(1) *Spirochæta anserina*, first noted and described by Sakharoff in Transcaucasia in 1891. Subsequently Dschunkowsky and Luhs observed the same parasite in geese in Tunis. In this disease intra-corpuscular bodies are found in the erythrocytes in addition to the free spirochæte, which latter morphologically resembles the spirochæte found in fowls. The parasite is inoculable to several species of birds, including fowls, but in the last-mentioned animals the disease induced by this organism takes a benign course, and recovery is the rule.

(2) *Spirochæta gallinarum* (*vel marchouxi*)—first described by Marchoux and Salimbeni as the cause of a fatal disease amongst fowls in Rio de Janeiro (Brazil). Intra-corpuscular bodies were not mentioned as associated with this parasite. The free spirochæte we have described in the foregoing article corresponds with the Spirochæta marchouxi, morphologically at any rate.

(3) A parasite (spirochæte) similar to the *Spirochæta gallinarum*, has subsequently been observed in fowls in many parts of the world—India, Cyprus, Martinique, Rhodesia, and Australia. Since the different authors make no mention of intra-corpuscular forms, apparently only free spirochætæ were encountered in these different outbreaks. Whilst investigating fowl spirochætosis in Queensland (Australia), Dodd states that he looked for the intra-corpuscular bodies mentioned by Balfour in Egypt, but these were not present in the Australian fowls.

(4) In the Anglo-Egyptian Soudan, as already mentioned,

Balfour in 1906 investigated a spirochætosis of fowls in which intra-corpuscular bodies occurred as well as free spirochætes. In this respect, at any rate, the disease we have now encountered in Cape Town seems to resemble that described by Balfour.

Balfour considers that "there is probably only one special avian spirochæte for domestic birds, namely, *S. gallinarum (vel marchouxi)*. He considers it unlikely that the Sudanese spirochæte forms a new and different species solely on account of its great tendency to cell parasitism. He observes, however, that this is much more marked in the case of the Sudanese spirochæte than with the Brazilian parasite (*S. marchouxi*). (It appears that Prowazek, who worked with the latter, observed it in some of his experimental cases.) Balfour thinks this may perhaps be explained by difference in the breed of fowls used or by difference in climatic conditions.

The present writer had the opportunity, in Europe some time ago, of studying the Brazilian *S. marchouxi* (or *S. gallinarum*) in experimentally infected subjects, contrasted with these we consider that the Cape Town spirochæte differs in several respects. Our investigations, however, are still incomplete, and we can express no decided opinion on this subject at the present juncture.

(5) Spirochætes.—Some similar to the Brazilian *S. marchouxi*, others corresponding to Balfour's spirochæte have subsequently been described by different investigators in the French North African possessions.

According to Brumpt, the spirochætes parasitic in the domestic birds which have so far been described, may be divided into four species:—

(1) Spirochæta anserina (Transcaucasia).
(2) Spirochæta gallinarum (Brazil, Somaliland, &c.).
(3) Spirochæta neveuxi (Senegal).
(4) Spirochæta nicollei (Tunis).

This observer bases his differentiation on (1) slight morphological differences between the different species, but more especially on (2) immunity reactions, and (3) differences in their degrees of virulence.

Thus he noted that a fowl which had recovered from the spirochætosis of Somaliland (*S. gallinarum V. marchiouxi*) still reacted when inoculated with *S. neveuxi*, though it failed to do so with *S. gallinarum*—*i.e.*, it was immune to the latter. Moreover, fowls cured of the Somali disease and hyper-immunized against the latter were still susceptible to the Tunisian spirochæte (*S. nicollei*). Two other investigators (Compte and Bouquet) have also shown that the Tunisian spirochæte (*S. nicollei*) differs from *S. gallinarum* (*marchouxi*). On the other hand Bonete's experiments seem to point to the probability of the identity of *S. neveuxi* (Senegal) and *S. gallinarum* (*marchouxi*).

With regard to the Cape Town spirochæte, in so far as the progress of one's researches on this subject permit one to express an opinion, the parasite we have encountered seems to resemble the spirochæte described by Balfour in the Anglo-

Egyptian Soudan (and the fowl spirochæte encountered by Galli-Valerio in Tunis and by Bouet in the French Soudan) more closely than any of the other species (or different strains) of fowl spirochætes which have so far been described. It remains to be proved whether all these parasites do really constitute different species as Brumpt supposes, or whether, after all, they are merely but different varieties or strains of the one avian spirochæte modified in regard to its degree of virulence and in certain other respects, as Balfour and some other investigators have suggested.

SYMPTOMS.

A chicken was infected experimentally by inoculation of a small quantity of blood containing free spirochætes. The organism appeared in the blood thirty-six hours after inoculation, and increased in numbers progressively until death, which occurred four days later. The drooping head, the ruffled feathers, disinclination to move, "crouching position," and general sleepy appearance are well shown. Later the bird seemed unable to stand and lay extended with its head stretched out and eyes closed. If touched the eyes were sleepily opened for a moment then closed again. In the early stage of the disease thirst was intense and diarrhœa also in evidence. The body temperature of acute cases is invariably elevated—in one of our experimental subjects it rose to 109°. After the crisis it speedily fell to normal (106 to 107), and this fowl (an adult in good condition) ultimately recovered after exhibiting symptoms of partial paralysis of the legs, intense thirst and diarrhœa for some days together with much wasting. In another bird the body temperature rose to 110°. The acute case may terminate fatally two to seven days after the appearance of the spirochætes in their blood—on the other hand the acute attack may be succeeded by apparent recovery to be followed by a fatal relapse in a few days, or it may be followed by a slowly progressing chronic form of the disease. In some birds again the disease assumes the chronic type from the commencement.

Acute rapidly fatal forms of the disease are seen especially in young chickens of a few weeks old. The malady is apparently less fatal for adult fowls.

The outstanding features of the chronic form of the malady are emaciation and anæmia, diarrhœa (this may or may not be present), and sometimes paralysis, partial or complete, of the legs, or of one or both wings. In this form of the disease there is often no marked elevation of the body temperature.

The *post-mortem* appearances in the acute diseases are: Enlargement of the spleen, some congestion of the liver, and sometimes also of the intestines. There is, of course, also anæmia. In the sub-acute and chronic forms of the disease one may encounter none of these alterations—enlargement of the spleen may not be in evidence, and beyond wasting and the signs of anæmia no marked morbid lesions may be apparent.

Treatment and Prevention.

Regarding curative treatment by means of medicinal agents we have not yet had an opportunity to try the effect of drugs in this disease.

For the Brazilian spirochætosis of fowls atoxyl in 5 centigramme doses (*i.e.*, about ¾ gr.) has been found useful. In Queensland Dodd has found another of the arylarsonates, namely, soamin, of benefit in the treatment of the malady. He administered the drug intramuscularly after having dissolved it in distilled water. The dosage employed for adult fowls was one-fifteenth to one-tenth grain. Some observers have found that quinine acted beneficially.

With regard to this disease it has been shown by several workers that after having passed through an attack of spirochætosis the subject is immune against subsequent infection with the particular species of spirochæte from which it has suffered.

Artificial immunity may be brought about by various means, but most of these are too costly to warrant their application to the average fowl of but low monetary value.

Compared with attempts at drug treatment or methods of artificial immunization against the disease, far better practical results are likely to accrue, we consider, from the institution of measures to eradicate ticks and other insect pests from the fowl runs. *These are the agents concerned in spreading the disease, and in their absence it is very certain that fowls will not contract the malady.* Moreover, there is little doubt that such vermin are capable of transmitting other fowl diseases as well as the one we have now considered.

Mr. Lounsbury, the Cape Government Entomologist, has already contributed several valuable articles on the subject of the fowl tick, and those interested in poultry, who have not already consulted these, will certainly profit by so doing. In these articles will be found full information regarding the nature and habits of the pests we have mentioned, together with advice on the best methods to adopt in order to eradicate them from infected premises, construction of "tick proof" perches, &c.

In their own interests, therefore, we advise fowl keepers to consult:—

The Agricultural Journal of the Cape of Good Hope, vol. xxiii, No. 3 (September, 1903), p. 261. "The Fowl Tick: Studies on its Life Cycle and Habits."

The Agricultural Journal of the Cape of Good Hope, vol. xxv, No. 5 (November, 1904), p. 548. "The External Parasites of Fowls."

THE INTERMEDIATE HOST OF THE LIVER FLUKE *DISTOMA (FASCIOLA) HEPATICUM.*

By J. D. F. GILCHRIST, M.A., D.Sc.
Cape Colony.

The Liver Fluke is the well-known cause of a serious disease in sheep in every country. In the winter of 1879-1880 about three million sheep succumbed to this disease in England, and similar, if not more extensive losses have been experienced in other countries. It not only causes serious loss to stock, but renders some excellent pasture land quite unsafe for the feeding of sheep.

For some time a considerable amount of mystery hung about the disease. It was observed that it was contracted chiefly in damp and swampy places, and was specially prevalent in wet seasons, but what connection this had with the disease was unknown till the life history of the parasite was traced. It was found that the young fluke had to pass a certain stage of its life history in the body of a water snail, *Limnæa truncatula*, and that in the absence of this particular snail the fluke perished and the disease necessarily disappeared. (For further details see the article by Hutcheon on "Fluke or Slak in the Liver of Sheep," in the *Agricultural Journal*, January, 1905).

Experiments were made with a view to find out whether or not any other fresh water or land snails could transmit the parasite, with negative results, except partially in the case of *Limnæa peregra*, young specimens being attacked by the parasite, which, however, did not develop further.

The disease, however, is prevalent in countries where *Limnæa truncatula* is not known to occur, and it was suggested that this rather small snail might be present but would be readily overlooked. Further investigation appears to show, however, that, in these countries, other snails may convey the disease, as for instance, *Bulimus tenuistriatus* in Australia (T. Cherry, in *Proc. Roy. Soc. Vict.* VIII (U.S.), 1896, p. 183).

In South Africa *Limnæa truncatula* has not been found, and there have been various attempts to find the intermediate host of the fluke in this country. One of the most ingenious if not accurate solutions of the question was forwarded to the Agricultural Department some years ago. It was stated that the intermediate host had been found to be a worm, and that the observer had watched the fluke escaping from its host into the water. On forwarding the specimen, however, the worm was found to be the spawn of a toad and the fluke the escaping tadpoles. There is a common water snail, *Physa*, found in damp and "flukey" ground, and this naturally was an object of suspicion in endeavouring to trace the disease. For the last two or three years specimens of this snail have been procured and examined, some from places well known to be dangerous on account of the practical certainty of sheep contracting the disease there, but no traces of *cercariæ* (the form the fluke takes in the snail) could be found. I am indebted chiefly to the Government Entomo-

logist and some of the students at Elsenburg for the material procured. The first indication of success was in a collection of snails forwarded by Mr. L. H. Walsh, who has for some time taken a great interest in the solution of this problem. One lot of snails (*Physa tropica*) was procured about the beginning of December from Alderman's Farm, near Fir Grove Station, and on dissecting about a dozen of these, two or three were found infested with *cercariæ*. These were, however, not those of *Distoma hepaticum*, as, of the two kinds found, one had a large flat bifurcate tail, and the other was provided with eyes. This, however, indicated the season in which the snails might be expected to be infected, and on procuring and examining a number of *Physa tropica* from Muizenberg Vlei, the typical stages of the fluke were found. About one in twenty of the snails dissected had the parasite. The *redia* stage and the *cercariæ* stage was found in this way, and the free swimming *cercariæ* were procured in the water in which the snails were kept for a time. The stage which occurs on the grass eaten by the sheep has not yet however been found, nor has the experimental proof of the infection been made so that the evidence as yet is incomplete.

It is remarkable how many fresh water molluscs are at this time of the year infected by different *cercariæ*. In addition to the three named, a fourth and very distinct kind characterized by its small size and bristly tail was found in a small snail, *Tomichia ventricosa*. The life history of these will probably prove of interest, and the adult stages will probably be found in frogs, water fowl, or other animals living near the water in which they occur.

As to the practical utility of a knowledge of the intermediate host of the fluke in South Africa, it may not be found possible to devise means of exterminating the snail (this would, of course, get rid of fluke at once) but it will indicate the source of danger. *Physa* can be readily recognized. It has a small shell of a yellowish colour and somewhat fragile; it can be distinguished also by the fact that it is a left-handed shell, that is, the windings when looked at from the apex and traced towards the opening, pass in a direction opposite to the hands of a watch, whereas in most other shells the winding is right-handed. The snail is somewhat difficult to find, and does not seem to occur in great numbers at any one place. The *cercariæ* can be got from infected snails by keeping them in a tube for a time when the parasites may be seen as minute white specks in the water just visible to the naked eye. They look like very small white tadpoles, but are by no means so large, the body being somewhat less than the dot over a small "i" in this journal.

Readers of the *Journal* may afford valuable assistance in the inquiry by forwarding specimens of water snails to the Zoological Department, South African College, Cape Town, for examination. They should, if possible, be sent alive, but specimens preserved in strong spirit, or three per cent. solution of formalin will be of value as will also the dried shell.—*Agricultural Journal of The Cape of Good Hope.*

Miscellaneous.

PROFESSOR J. R. U. DEWAR, F.R.C.V.S., has sent in his resignation of the post of Principal of the Royal (Dick) Veterinary College, to take effect from the end of this session.

Mr. J. T. SHARE-JONES, M.Sc., F.R.C.V.S., has been elected President of the Liverpool University Veterinary Medical Society for the present year.

Translations.

DEATH FROM LIGHTNING STROKE.

By A. TAPKEN.

District Veterinary Surgeon, Varel.

DEATH through lightning stroke occurs in neighbourhoods where summer pasturing is prevalent, generally on the meadow, seldom in the stall, or in horses in the team at work. As many animals are insured against lightning stroke the cause of death must be certified by a veterinary surgeon. Some reflections on lightning stroke and the appearances it causes may not, therefore, be out of place.

Here in the Oldenburg country it is generally cattle, often horses, and rarely sheep, swine or other animals that are killed by lightning. Now it is only a single animal, and again two, three, or more that fall victims. Generally the lightning strikes where the animal stands, but occasionally the stroke is transmitted greater or less distance by means of the iron wire or barbed wire which encloses not a few of the meadows round here. In this way I have seen the lightning strike a poplar tree and immediately kill a cow thirty or forty paces away in the meadow. The poplar was encircled with a barbed wire which led to the gate of a field. Here the cow had stood. She lay flat on her side with her head turned towards the gate. Inside the gums I found a burn scar about the size of a pea.

In another case four cattle were killed at one time, although they stood thirty paces from each other, all being near barbed wire. They all lay with their heads towards the wire. In a further case three cattle were killed at the same time, when standing near wire, and a few steps from each other, and two fell into a grave which had been dug near to the wire.

In the Oldenburg district it was reported in the agricultural press that twenty horses and cattle had been killed by lightning in 1908, and eleven of these had died through contact with the wire. It was therefore recommended to interrupt the wire and conduct it through the ground. Dieckerhoff, Fröhner, and Friedberger state that where the electric stream is weak or only

strikes in the neighbourhood without hitting, stupefaction and paralytic symptoms may ensue; and the latter arising may remain. I have never noticed this result, but it is possible that here, where the animals are more or less far removed from dwellings of their owners, that short continuing stupefaction would not be noticed.

The anatomical findings, according to Friedberger and Fröhner and others, are not very characteristic. One generally finds engorgement of the venous system, with dark, thin fluid blood, quick putrefaction of the cadaver, incomplete rigor mortis, as well as small hæmorrhages in the internal organs and under the serous membranes, besides singeing of the hair; in addition, burning or tearing of the skin and the white parts, and, according to Gerlach, even fracture of bone. Occasionally one may encounter quite a negative result.

Although one generally conducts a *post mortem* if desired, yet in lightning stroke, owing to the difficulty and unsatisfactory nature of a *post mortem* on a meadow, it is usual to avoid this matter if possible and to establish the fatality by traces left on the surface of the body. In my experience, 90 per cent. of the cases show greater or less singeing of the hair. Most frequently one sees stripe-like singeing over the bones or under-surface of the belly, but often enough in other places. The singed stripes are 3 or 4 mm. broad. They run as a rule parallel on the bones from below to above and close together at the rump. These stripe-like singeings are very characteristic. Only the points of the hair are singed and the hair stumps near the skin ruffed up. Not seldom one finds such stripes on all four limbs and at several places on the rump. There may be flat-shaped singeings on the head or rump. Sometimes there is quite insignificant singeing on the lips, eyelids, inside the ear, at the tail, on the forehead, and once, as I have already noticed, a small burning scar.

According to Friedberger and Fröhner, in white-spotted cattle only the white spots are at times affected. This, in my opinion, is only correct in so far as in these subjects the limbs and under-surface of the abdomen are white as a rule, and here singeing usually takes place. For the rest, from my observations I find black equally as much affected as white places. Rents of the skin or deeper wounds I have never seen in cattle, and only twice in horses.

In one horse there was a transverse wound in the neck 2 cm. long, 1 cm. broad, and 1 cm. deep. In another case a foal standing with its mother on the meadow, and both being killed by lightning, I found two large pools of blood, one in front of the nostrils and the other under the ear of the foal. Two rents of the skin were present in the ear, one external and the other internal, going right down to the root of the ear. Diagnosis is difficult when a dead animal is found in a dyke where there is much water. Singeing of the hair in a wet carcase or one covered with mud is not easy to discover. It then becomes necessary to differentiate between lightning stroke and death by drowning. Gerlach says death through drowning seldom occurs, and only in the small domesticated animals. But drowning may

follow a fall into a deep, narrow dyke where the head doubles up under the body and where young stock put out to pasture in spring are not used to approaching the waterways carefully; they become stiff and numb at first, and finally die from drowning.

Three swine killed in a sty by lightning showed the distinct appearances of death from suffocation, especially cyanosis of the body coverings.

Besides singeing of the hair I have noticed injected places under the skin and in the subcutaneous tissue at these spots. A careful examination is necessary if there are no external signs of lightning stroke, because there are owners who put down other illnesses to lightning stroke and do not always see an ailing animal out at pasture previous to a thunderstorm. In very rare cases eschars occur, which, after careful examination, are difficult to discover.

(*Deutsche Tierärztliche Wochenschrift.*)

A CASE OF EPILEPSY.

By Chief Veterinary-Surgeon GROSCHE.

A horse belonging to a regiment of Cuirassiers, which was known as one of the best and most strenuous of the first squadron, had during the last two years half-yearly attacks of epilepsy, which as time went on increased in violence. Most of the attacks occurred in the winter half of the year. Only one was noticed in the summer. Before and after the attacks, only lasting for one day, the horse performed his vigorous service (patrol duty) without any injury. Any reason for the occurrence of the illness at half-yearly periods could not up to the present be discerned. Neither the greatest exertion nor total rest seemed to be predisposing factors. What was more, the spasms occurred without visible cause. The appearances of illness were as follows: For about an hour the horse moved restlessly up and down with anxious look. Then symptoms of spasms appeared. They began at first at the head, with trembling movements of the ears and nostrils. The eyes were staring. The pupils dilated to the full extent. The head was held in a sunken position. The horse drew back from the manger and steadied itself by hanging on the halter and chain. At a later stage the head was raised, and head and neck bent to the right. Convulsions now occurred in the muscles of the jaw. The mouth was held open and tongue held out limply at the side. Eyes, pupils and nostrils were opened wide; conjunctival mucous membranes coloured dark red, and power of vision arrested. The last was shown by him bumping his head on anything in the way. Soon after the occurrence of convulsions of the jaw the spasms advanced over the neck to the muscles of the rump, and finally over the whole body. At the same time there was profuse perspiration over the whole body. The pulse-rate was 80 per minute. The pulse beats were throbbing. The respirations were 60 per minute. As the patient

staggered a good deal he was loosened and swayed then sideways and backwards. His gait was groping, stiff, and uncertain. Anything in the way was not noticed, and although being led the subject would suddenly fall. After falling headlong the convulsions gradually ceased, the horse got up, and drank some water. Immediately after another similar attack of like violence occurred, but of shorter duration. Whilst, according to Friedberger and Fröhner, the longest attack only lasts half an hour, these attacks lasted an hour and ten minutes. The first part of the attack occupied three-quarters of an hour and the second twenty-five minutes. Whether both were separate attacks or only one I am unable to say. As soon as the horse had recovered he was led slowly into a dark box. No medicine was given. In the dark box he had three slighter attacks, followed by slight bowing of the head, but from these he quickly recovered. Between and after the attacks the animal appeared dull for the day. On the next day the sensorium of the horse was quite normal. The patient got over his weakness after a few days' rest, and was put to work, and up to to-day there has been no recurrence.

(*Zeitschrift für Veterinärkunde.*)

THRUSH IN PIGS AND EXPERIMENTAL OÏDIAN SACCHAROMYCOSIS.

By Professor I. Poenaru.

Thrush is very frequent in weak or insufficiently-nourished children, but one rarely observes it in adults. This complaint seems to have been little studied in the domesticated animals and a few known clinical observations treat only of the symptomatology of thrush.

Delafond had inoculated with success the *Oïdium albicans* of children into debilitated lambs, but the experiences with *Saccharomyces albicans* of animal origin have failed up to the present.

Cadéac, in his pathology of the internal organs, says: "It is pretended that thrush rages in colts, calves, and poultry, but it is only hypothesis." There are others who say that the illness is also known in cats and the dog; however, nobody, until to-day, has described it in the pig.

During this year I have observed a very young pig nourished on the artificial teat that presented on the tongue rounded plaques of a dirty creamy white, assuming the form of pseudo-membranes and easily detachable from the mucosa. The pig was thin, held its mouth open, and suction and deglutition were painful. It was killed during the illness.

The whitish plaques of thrush were constituted by desquamated epithelial lamellæ, filaments of mycelium, spores of the parasite, many other microbes and some leucocytes.

In making cultures on potato and carrots, acidified by two

drops of a fifth sulphuric-acid solution, I obtained pure cultures of a creamy white. The parasite presented in these cultures a double aspect; spherical or oval refracting cells (yeast), some of which were budding; some tubular-partitioned filaments, ramified once or twice and alternating with each other.

By injecting pure cultures (in saccharated bouillon) into the peritoneum of young rabbits, I noticed in one of them that was rachitic a pseudo-tuberculosis of the liver and peritoneum. The tubercles resembled little isolated or confluent pearls of a snow-white colour, being formed by necrotic tissue. In all these lesions round cells (yeast) and filamentous forms of the *S. albicans* were found. We have, as a result, an experimental oïdian saccharomycosis of animal origin.

Conclusions.—(1) Pigs are animals capable of contracting thrush; (2) *S. albicans* of pigs is as pathogenic as *S. albicans* isolated from children; (3) By injections into the peritoneum of rabbits experimental oïdian saccharomycosis can be produced.

(*Arhiva Veterinara.*)

ROARING DUE TO A TRACHEAL SARCOMA.

By KARNBACH.

The German regulation of March 27, 1899, declared as prohibitory vices causing roaring all chronic and incurable lesions of the throat or the aeriferous conduits denoted by an abnormal noise. Stenosis of the trachea comes under this category. It is generally due to a fracture, a luxation, or deformity of the tracheal cartilages: these cases are easy to diagnose. It is not so with tracheal tumours, especially primary ones, which are, however, very rare.

The author observed such a case in a nine-year-old horse whose roaring had been treated by tracheotomy without success, the tumour being situated in the inferior part of the trachea. The persistence of the noise led him to think there was tracheal stenosis, but this was not revealed by palpation. Sounding showed at the entrance to the chest a hard mass almost completely obstructing the lumen of the tube and dilating it. An operation was advised, but the owner preferred to sell the animal to the slaughterer. The tumour in question was situated at the level of the fortieth cartilaginous ring; it was as large as an apple in size and was firmly adherent to the posterior part of the wall of the trachea by a base as large as a five franc piece. Histological examination showed the sarcomatous nature of the neoplasm.

It is impossible by actual diagnostic methods to differentiate roaring due to these tumours from troubles arising from paralysis of the recurrent.

(*Monatsschrift für praktische Thierheilkünde.*)

A CASE OF BOTRYOMYCOSIS OF THE MAMMÆ IN A FILLY.

By CUNY AND AUGER.

Cases of cure are rare in France. Prompt extirpation enabled the authors to save this subject. Three years old, the filly had shown intermittent attacks of mammitis for six months, leaving the organ deformed and pierced, with consecutive fistulæ and little abscesses. The general state was good. External applications were useless. Palpation revealed indurated nodules scattered in the swelling; the microscope showed some botryomyces. The patient was cast, the skin folded back on each side of a median incision 40 centimetres long, and the two mammæ extirpated after ligature of the afferent vessels. To stop profuse hæmorrhage a tampon of aseptic wadding was placed under the skin; on the morrow the filly was again cast and the tampon removed, together with a two-litre clot of blood; the wound was cleaned, drained, and sutured at its edges. Commencing gangrenous septicæmia yielded to lavages and injections of oxygenated water. The wound cicatrized slowly after suppuration and multiple abscess formation. After five months cure was complete.

Nevertheless the authors hesitate to advise total and hasty ablation always, if one wishes to avoid relapse and generalization.

(*Revue Générale de Médecine Vétérinaire.*)

Letters and Communications, &c.

Mr. L. E. W. Bevan; Professor J. T. Share Jones; Mr. G. Mayall; Mr. E. Wallis Hoare; Mr. R. Ferguson Stirling; Professor Duncan; Mr. R. H. Lambert; Mr. W. Jowett; Board of Agriculture and Fisheries; Department of Agriculture and Technical Instruction for Ireland.

Books and Periodicals, &c., Received.

Proceedings of the Royal Society of Medicine; Bulletin of the Bureau of Sleeping Sickness; The Animals' Friend; Journal of the Royal Army Medical Corps; Agricultural Journal for South Africa; Rhodesian Agricultural Journal; The Encyclopædia of Sport (Mr. W. Heinemann, in fortnightly parts, 1/- net).

Note.—All communications should be addressed to 8, Henrietta Street, Covent Garden, London, W.C. Telephone, 4646 Gerrard. Telegrams, "Baillière, London."

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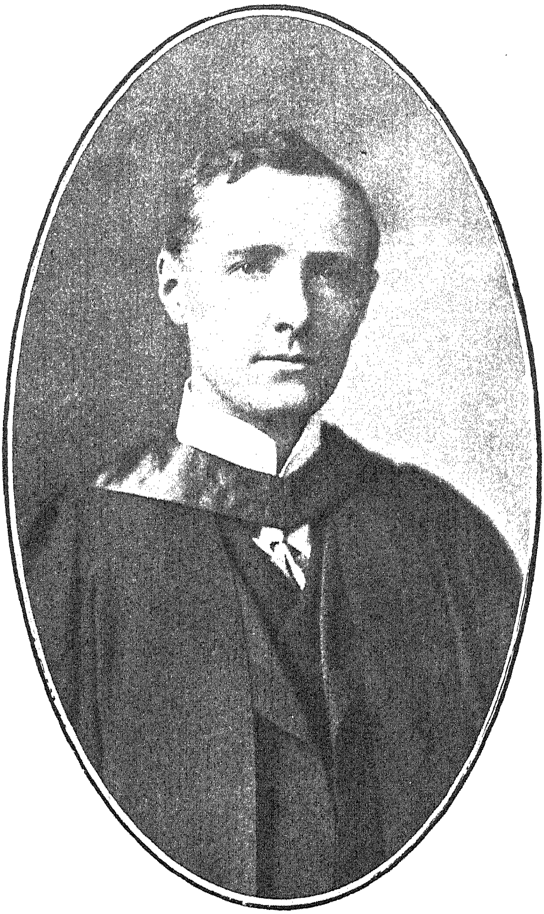

PROFESSOR O. CHARNOCK BRADLEY, M.D., D.Sc., M.R.C.V.S.

THE

VETERINARY JOURNAL

MAY, 1911.

Editorial.

SCARLET FEVER IN RELATION TO COW'S MILK.

THE very excellent article on the above subject by Mr. W. Hunting, which we reproduce in this issue of the VETERINARY JOURNAL, is a masterly resumé and criticism of the evidence that has been brought forward to support the contention of many medical authorities that scarlet fever in the human subject may have a bovine origin. In common with the vast majority of the members of the veterinary profession, Mr. Hunting disagrees with those medical men and his arguments appear to us to be unanswerable. In this case, as in some other diseases of man which have been attributed to the cow, the failure to find a human source for the contamination of the milk is a very long way from proving that the cow is suffering from that disease. That these diseases may be milk borne is quite a different matter, and is, of course, beyond dispute, but that is just as easily the result of human contamination as of bovine origin, since the milk is drawn by human agency and is handled as a rule by various changes of men before it is consumed. None of the reported cases of bovine origin will bear really searching investigation, and we should think it almost impossible for anybody reading Mr. Hunting's searching account of the famous Hendon outbreak to come to any other conclusion than that the cows must be acquitted of any share in the origin of the disease. In the discussion that followed the delivery of the paper, many prominent medical officers of health took part, and it is gratifying to note that there were very few supporters of the old theory left, although some were not satisfied to give

the cow a clean slate in this connection. But, as Mr. Hunting pointed out, nobody has yet shown that the cow could be infected with scarlet fever. All experimental efforts to infect cows had negative results. Dr. Louis Parkes agreed with Mr. Hunting that there is no evidence that scarlet fever is a disease of bovines transmissible through milk to man. But while admitting this, he put forward a very interesting theory suggesting the possibility of ulcerated teats being inoculated with the scarlet fever organism by the hands, &c., of a milker who might himself have a concealed attack or be a carrier. In this way he thought it possible for a cow to act as an intermediary between a human source of scarlet fever and the consumer of the milk. More recently Dr. Savage has put forward a similar theory at a meeting of the Epidemiological Section of the Royal Society of Medicine. He suggests "(*a*) That the cow may be a source of human disease, not because it is constitutionally infective, but because it is acting as a carrier of human infective organisms, and (*b*) that disease (not including tuberculosis) of the milk-producing organs of cows is only likely to be harmful to man when the causally associated organisms are of human origin or when human organisms are superadded as a secondary infection." This theory is certainly interesting and worthy of further examination, but Dr. Parkes dealt it a severe blow when he pointed out that it was very doubtful if the scarlet fever organism would survive for long on an ulcerated teat in association with the countless septic organisms on the ulcerated surface. Until the causal organism of scarlet fever is isolated and identified very little progress can be made in elucidating these outbreaks.

The veterinary profession has been for years looking in vain for evidence of scarlet fever in cows. We might almost be forgiven if we expressed a hope for some positive proof, for if the cow were proved to be a definite source of danger it would make more work for veterinary surgeons and expedite the institution of a more complete system of inspection of dairy cows.

General Articles.

SCARLET FEVER IN RELATION TO COW'S MILK.*

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MILK-BORNE epidemics are not uncommon, and are characterized by the outbreak of disease being sudden in onset and wide in distribution. When the method of spread of such infections is discovered the law provides for the immediate control of the mischief by prohibiting the sale of the milk. This action prevents further infection, and affords time for inquiry into the way in which the milk became contaminated.

If scarlet fever is due to a specific organism and is a disease peculiar to human beings we should naturally look for a human source of infection in all outbreaks. In ordinary outbreaks unconnected with milk no one looks for an animal as the source of infection; it is assumed that infection has been carried by a human being. In the majority of milk-borne outbreaks the infection has been traced to a human source; in fact, it is uncontroversial that milk may be contaminated directly by persons suffering from scarlet fever, or indirectly by attendants on a scarlet fever patient.

There have been milk-borne outbreaks in which careful inquiry has failed to detect any case of scarlet fever in human beings connected with the collection or distribution of the milk. This failure to detect the source of infection, to know how the first case arose, is a not uncommon event in many cases where an epidemic appears. Sometimes the inquiry is too limited, sometimes there are urgent reasons for anyone having knowledge to keep their secret, and sometimes the infecting person does not suspect the mischief he has done or is doing. To quietly assume that the non-discovery of a human source of infection is evidence that no human source exists is hasty and illogical.

Probably milk-borne outbreaks of disease would have been accepted by everyone as due to human infection had not a too fertile brain formed a theory that some human ailments arose by infection from animals showing no signs of any recognized

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disease. This theory accounts for the belief that cows may suffer from some morbid condition which so contaminates their milk that its consumption by human beings leads to the development of scarlet fever. Veterinarians have so far failed to recognize any such condition in cows, and they believe that no sufficient evidence has yet been brought forward to warrant the statement that scarlet fever of man can be traced to the cow.

In all the outbreaks of scarlet fever that have been supposed to arise from some disease of the cow there has been found an eruption on the teats of the animals. The inference from this is that the mysterious morbid condition of the cow has at least one definite symptom. But the value of this symptom is reduced to a minimum when we know that few herds of milch cows are free from skin lesions on the udder and teats. Cracks, abrasions, sores, scabs, and ulcers are produced by various causes and by some well-recognized diseases. They exist, constantly, in cowsheds from which no human disease has been traced. They become infected with the ubiquitous streptococci, and this infection is carried from cow to cow by the hands of the milker. Something more than an eruption on the udder of cows must be discovered before even a sore throat in man consuming the milk can be rationally connected as cause and effect.

Scarlet fever is in many cases difficult to diagnose. Some cases are very slight, some quite atypical, and many are infectious long after any definite signs of the disease remain on the patient. It must then be easy for milk to become contaminated after leaving the cow. In fact, it only requires contact with any of these unrecognized human carriers. In my own sphere of practice outbreaks of glanders, foot-and-mouth disease or swine fever have often occurred, and the most careful inquiry failed to trace the source of infection. We rest satisfied that there was an animal source, but that we were unable to trace it.

The hypothesis that outbreaks of milk-borne scarlet fever might be due to some undefined disease of the cow has not been much in evidence of late years. A report by Drs. Hamer and Jones upon an epidemic of scarlet fever in London and Surrey in 1909 has, however, revived it. A brief review of this report will, I think, show that no fresh evidence has been adduced to support the theory, but that it still rests solely upon the two conditions first adumbrated by Sir W. Power in 1885, (*a*) failure

to find a human source; and (*b*) the discovery of an udder eruption: two conditions affording insufficient basis for any assumption that the cow can cause scarlet fever in man. The facts of this outbreak are as follows:—

In June, 1909, outbreaks of scarlet fever appeared at Worcester Park, Kingston, Westminster, Chelsea, Wandsworth, and Croydon. These were traced to a milk supply distributed from ten or twelve depôts. After a most painstaking and ingenious investigation the infected milk was found to have come from one depôt supplied by thirty-one farms. These farms were examined, and very quickly farm X was recognized as the only one which could be directly connected with all the outbreaks.

The first notifications of disease were made on June 14 and 15, and reports of fresh cases by medical officers of health continued to come in till June 18. The milk supply was stopped on the 19th.

Farm X consisted of two farmsteads distinguished as X 1 and X 2, each having separate herds of cows, although the milk from both may have been mixed. Half a mile from the farm was the cottage of the carter whose daily work was to take the milk from the farm to the depôt. He also lent a hand in milking the cows at both farmsteads whenever his help was required. This carter, G. L., generally went first to get the milk from X 2, milked two cows there morning and evening, helped to lift the churns into the cart, and then proceeded to X 1 where he also occasionally milked a cow before taking the churns to the depôt.

At this man's cottage on June 20, the reporters found him, his wife and three children, all suffering from scarlet fever. The first child had sickened on June 11, the next on June 13, the father on the 14th, the wife and third child on the 15th. The carter stopped work on the 15th, having milked two cows on the preceding evening.

At farmstead X 1 lived the farmer, his wife, and her sister, and the foreman milker. There had been no illness on the premises since Easter, when the foreman had influenza. There were twenty-seven cows at this place, "one with a cough."

At farmstead X 2 lived a milker, his wife, and her mother, and six children, all apparently in good health. There were thirty-two cows on the place. Several had recently calved, "and the condition of three excited suspicion."

This, I think, is a fair but condensed account of the facts as given by the authors of the report. At first sight it would seem to be a clear case of human infection by the carter G. L.; but the reporters conclude that he and his family were infected by the milk, just as were the persons in the different districts mentioned, and they trace the source of infection to some disease of the cows.

Of course the carter could not be the source of infection if milk consumers outside of the farms had been seized with scarlet fever previous to his being attacked. His child showed symptoms of the disease on June 11; the earliest notified case was on June 14, which allows ample time for infection through the milk after contamination by the carter or his family. But the reporters meet this difficulty by ante-dating the general outbreak to June 7 or 8. Their excuse for so doing is, "further inquiry, however, was made of the medical officer of health, who wrote as follows: 'The doctor who notified nearly all the cases on the 18th says he had several cases of sore throat during the week previous, not followed by rash and not notified.'" Surely this is begging the question, and assuming that the sore throats must have been scarlet fever, which is not proven. Milk-borne outbreaks of scarlet fever are peculiar for their suddenness, their almost explosive force. They do not commence in driblets of sore throats spread over many days. The report says: "It would appear that the milk distributed from farm X was infective on June 7, 8, 9, and 10, non-infective on June 11 and 12, and again infective on June 13." This statement may be evidence of the minute care taken by the inquirers, but it certainly does not point to a cow disease. From June 7 to 18 the milk was infective, and one cannot believe that for two days of this time the cows ceased to infect their milk if they were diseased. A very much more simple explanation is that carter G. L. did not on the 11th and 12th assist in milking any cows. We know he milked cows on the 14th, and stopped work on the 15th; we do not know whether he milked on June 11 and 12. We are between two possible explanations: either the cows or the carter's family infected the milk. If the carter and his family got scarlet fever by drinking cow-infected milk, how is it that the family, including six children, at X 2 did not suffer at the same time and in the same way? These

children were surely not immune, and their risk of infection was not less, as the cows at both farmsteads were found to have lesions on their teats, lesions of no special nature, but such as are found generally among milch cows.

Several cows were found presenting no teat-lesions, they had not been milked, although living under similar conditions to the others. This, it is claimed, militates against the assumption that the lesions were traumatic. I draw the opposite conclusion. They had not been milked, and so their teats were not abraded or injured by the hands of the milkers. They afforded no nidus for the development of the streptococci. They were in contact with the other cows, they were subject to the same surroundings. A disease capable of giving rise to scarlet fever in man can hardly be a mere local udder affection, and we may presume that if it were a general affection these cows ought to have been affected as were the others.

There is a mention in the report of three cows which had only recently calved, and a hypothesis is rather timidly put forward that this natural function of cows may in some way have brought about such a morbid condition as to render their milk capable of spreading scarlet fever among human beings consuming it. I suggest that this theory has no single fact to support it, and probably would never have been made had not Sir W. Power unfortunately anticipated it in 1882.

We cannot imagine a disease possessed of such potentialities as that the poor cow is assumed to have, without some definite symptoms. Is an udder eruption necessary? Is loss of hair and condition a sign? Is the act of parturition a factor? These conditions are common enough when no scarlet fever exists in the neighbourhood or in the sphere of the milk distribution. Until some more definite description of the supposed morbid state which enables cows to secrete scarlet fever is given, I think we are safe in denying that there is any real evidence against the cow.

The report of Drs. Hamer and Jones receives the support of the Medical Officer of Health to the London County Council, who says: "The question of infection of milk being of bovine origin needs to be considered. Under similar circumstances Sir W. Power, in 1882, when investigating an outbreak of scarlet fever in certain London districts, made the suggestion that

inasmuch as 'there is one sort of relation between scarlatina and accidents of the puerperal state, another sort of relation becomes comparatively easy of belief,' in fact, that 'if scarlatina in man have other animal source than human source, it may be that one such source is the cow that has recently calved, a cow not at all ill (except for her parturition) or not so obviously ill as to prevent her milk being used for human consumption.' The suggestion thus tentatively made in 1882 at once assumes large importance upon the demonstration by Sir W. Power, in 1885, of the bovine origin of scarlet fever occurring in persons consuming milk from a Hendon farm the cows at which were affected with an eruption of the teats and udder. A similar development of scarlet fever in man, associated with the consumption of the milk of similarly affected newly-calved cows or cows infected from such newly-calved cows has been observed in a number of instances since that date."

Sir Shirley Murphy uses the words "upon the demonstration by Sir W. Power in 1885 of the bovine origin of scarlet fever" at Hendon. These words assume that the interpretation of the etiology and pathology of the "Hendon disease" by Sir W. Power was correct and is established. Fortunately Sir G. T. Brown ordered an investigation into this Hendon outbreak, and his conclusions were vastly different from those of Sir W. Power. Before comparing some of the differences shown in the two reports I may draw attention to a rather suggestive fact. Since 1885 veterinarians have had their attention fixed upon Sir W. Power's theory. They have given careful observation to newly-calved cows, to udder eruptions, and to outbreaks of milk-borne scarlet fever in man. Not one of these observers has been able to trace any connection between scarlet fever and cow disease. Of course it may be retorted that they were wanting in knowledge or intelligence, an accusation I am willing to face.

I find in Swithinbank and Newman's standard work on "Bacteriology of Milk," 1903 edition, an outline of thirty-seven milk-borne outbreaks of scarlet fever; of these twenty-six were traced to a human source, and nine were alleged to be due to cow disease. These nine all start with the same negative evidence, failure to trace a human source, and they all seem to adopt the same line of reasoning as was initiated by Sir W. Power at Hendon.

A reconsideration of the Hendon case seems essential if we are to fairly investigate future milk-borne epidemics of scarlet fever. Only when Sir W. Power's account is generally accepted as proven can it be allowed as argument in other cases to say of any observation or inference that "it closely followed what was found in the Hendon case." If Sir W. Power was wrong, similar sources of error are to be found in the reports of investigators who have followed him.

The Hendon outbreak occurred about the end of November, 1885, and continued until the third week in December. Early in 1886 the Local Government Board published a report, by Sir W. Power and Dr. Klein, tracing the outbreak to a disease among cows on Mr. Panter's farm at Hendon. There is no dispute that the milk from the farm spread scarlet fever, and that the cows were affected with some udder disease. The question not settled is whether the udder disease was the cause of the scarlet fever, or whether it was only co-incidental and not causal. Sir W. Power and Dr. Cameron (the medical officer of health) maintained that no human source of contagion existed. Dr. Cameron's annual report for 1885 says: "In the last week of November two mild cases of scarlet fever came to my knowledge in 'The Mead.' Both were carefully isolated and disinfectants supplied. As the district is full of laundries it is possible that the disease came from London; there was no other evident source for it. The fever did not spread beyond either of these houses."

Sir W. Power's first argument in favour of the cow being the source of infection was that no human contagion could be traced. The "Mead" is 600 yards from Panter's cowsheds, and some of his men lived there. Dr. Cameron's statement that "the fever did not spread," can only mean that he was unacquainted with any spread. Clearly, too, he could only surmise how the Mead cases arose. The infection might have come from London with the dirty linen, it might have resulted from unrecognized cases at the Mead, and it might have been carried by infective persons visiting their friends there. If the source of the first case at the Mead cannot be traced, it is a large assumption to put aside as impossible a human source of infection of the milk.

This probability was ignored and search at once made for a

cow disease. Three newly-calved cows had been brought into the sheds on November 15. They suffered from an udder eruption which spread to other cows and was indistinguishable by its symptoms from the well-known appearances of cowpox. I quote the symptoms from Professor Crookshank's "Bacteriology." He says: "Dr. Cameron has given a detailed description of the clinical history of the disease. The teats became enlarged and œdematous. On handling them there was no feeling of induration. Vesicles appeared upon the swollen teats and upon the udder between or near the teats. These varied in number from two to four on a teat and in size from a pea to a horse bean. The vesicles contained a clear fluid. The vesicles were rubbed and broken in milking and left raw sores, sometimes red, in other cases pale in colour with raised ulcerated edges. Sometimes a few accessory vesicles formed around the margins of these ulcerated sores. After the rupture of a vesicle a brown scab formed which might remain attached for five or six weeks or fall off in ten days or a fortnight, a smaller one forming afterwards. A thin watery fluid exuded from under the scab and the sore ultimately healed. . . . . Some of the cows were also suffering from an eruption on the rump and hind quarters, consisting of patches of eczematous crusts. When the crusts were picked off the hair came with them exposing a raw moist sore. Dr. Cameron stated that he learnt the disease was capable of being communicated to milkers by inoculation with virus from the vesicles on the teats, though the milkers on the Hendon farm escaped. He adds that it was strongly asserted by several people who examined the cows that they were suffering from cowpox."

This description is a very good one of the lesions of cowpox, as seen by country veterinary practitioners in frequent outbreaks. The Local Government Board report denies that these were the symptoms of cowpox, because no papule had been observed, or subsequent formation of pustule, areola or pitting, and because the vesicles were not umbilicated. On which Crookshank comments: "These reasons given for dismissing the diagnosis of cowpox at Hendon were totally inadequate; a comparison having been made between the characters of an eruption of vaccinia as it appears on an infant's arm, instead of the eruption of the natural or so-called spontaneous disease on the teats of cows."

It has always seemed to me somewhat curious that the investigators of the Hendon disease should not have troubled to test the nature of the udder eruption by inoculating calves not with streptococci from old lesions, but with the clear contents of vesicles. The experiment might have given negative results, or it might have given the calf cowpox, and so rendered the nature of the eruption certain.

The Local Government Board report would have us believe that the udder disease was indicative of some special disease of the cow, capable of infecting human beings with scarlet fever if they consumed the milk, in short, that the disease of the cow was scarlet fever.

The veterinary department of the Privy Council, after a careful inquiry, also issued a report of the Hendon case, and arrived at the conclusion that the cow-disease was only cowpox, accidentally coincident with an untraced human infection of the milk. Professor Axe, one of the reporters, traced the three cows, purchased by Mr. Panter, as being part of a lot sent from Derby, some of which were sold to four different cowkeepers. To each of these men's farms the new cows carried an udder disease having the same appearance as the Hendon cases. Mr. R. Keevil saw the Hendon cases, and recognized them as the same as those on his farm. Mr. Vipon happened to be a surgeon, and to have seen previous outbreaks of cowpox. He diagnosed the disease in his new cows. Mr. J. Keevil had cases, and the nature of the disease was demonstrated by two of the milkers becoming infected on their hands. Dr. Bates, of Merton, informed Professor Axe that the men "suffered from a well-developed attack of vaccinia, contracted by them in milking."

The milk from all these different cowsheds passed into daily consumption; but no outbreak of scarlet fever was reported from the wide circles of their milk distribution.

Sir W. Power's report derived much strength from the work done by Dr. Klein, who was associated with him in the investigation of the Hendon and other similar outbreaks.

Dr. Klein discovered in the sores on the cows a micro-organism similar to one he found in human beings suffering from scarlet fever. In August, 1891, Dr. Klein contributed a paper to Section III of the International Congress of Hygiene and Demography on "Infectious Udder Diseases of the Cow."

In it he says: "The micro-organism which I isolated from the Hendon cows and from cases of human scarlet fever I still firmly maintain to be the micro-organism of scarlet fever, viz., the *Streptococcus scarlatinæ*." If this is still Dr. Klein's position it is unnecessary to refer further to the bacteriology of the question. No other pathologist believes that a streptococcus is the causal organism of scarlet fever, although it is often associated with that disease, as it is with many other diseases both of man and animals.

One would naturally expect that some experiments would have been undertaken to infect bovines with scarlet fever virus. If that had been successfully done a long step would have been made to show that animals were susceptible to the disease, and might therefore transmit it to human beings. Many such experiments have been made, but only with negative results. The materials used were blood, peelings, and mucus from the throat. The attempts to infect were by subcutaneous injection, by ingestion, and by contact with mucus-lined passages.

Experiments were also made with cultures of the streptococcus, which were injected under the skin and gave rise to septicæmia. Injection of cultures of streptococci collected from patients not suffering from scarlet fever or from udder diseases have also been made, and have given rise to similar septicæmic symptoms and lesions.

In the report of Drs. Hamer and Jones it is asserted that the udder eruption was not cowpox, and the symptoms detailed by Mr. Duncan, veterinary inspector, support that negative diagnosis. There is a number of recognized diseases of cows' udders characterized by an eruption. Cowpox is distinct; so is the eruption found on the udders of cows in Edinburgh in 1887. So also are the common lesions (sores, cracks, and abrasions) which are simple until aggravated by the milkers' hands and infected with the ubiquitous streptococci. All have been suspected by observers looking for cow-disease to explain a mysterious infection of milk. All have existed at many places and often, when no scarlet fever prevailed among the milk consumers. When an udder disease of cows is found in a cowshed the milk from which spreads scarlet fever, I think we may safely acquit the cow of any share in the outbreak and concentrate attention upon finding a human source of infection.

THE OCCURRENCE OF ACTINOMYCOSIS IN COWS' UDDERS.

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IN any literature I have read on the subject of Actinomycosis, little mention is made of the lesion as occurring in the udder of the cow, whereas the disease in the mammary gland of the pig appears to be fairly common; one observer, Rasmussen, having seen as many as fifty-two cases at the abattoir in Copenhagen within a period of three months.

It would therefore appear that this disease in the udder of the cow is a comparatively rare one.

From my own experience, however, I am of opinion that the udder of the cow is not an uncommon site of the disease, for within the last two years I have examined about fifty specimens of udders for suspected tubercle, and out of that number have found the lesion in five of the cases to be due to actinomyces, or an average of about 10 per cent.

In none of these cases was the lesion observed in any other part of the carcase, so that presumably the infection took place by the teat from the bedding.

Specimen No. 1 was brought in by a veterinary surgeon to have his diagnosis of tubercle confirmed.

The specimen on palpation and to the naked eye had all the appearances of being tubercular. When cut into, the organ was found to contain large numbers of small cream-coloured foci, similar to tubercles, ranging from the size of a pin head to that of a split pea. The substance of the udder was also of a brownish tint, so often seen in cases of tuberculosis of that organ. On *smear preparations* being made in the usual way, and examined microscopically, no tubercle bacilli were found.

Convinced, however, that the specimen was tubercular and that the failure to find the bacilli was due to a small number being present, as I have often experienced, I prepared and cut sections in paraffin.

On staining these sections by Ziehl-Neelson's carbol-fuchsin I was surprised to find the lesion was entirely due to actinomyces.

Specimen No. 2 was similar, both on palpation and to the naked eye.

Smear preparations showed no tubercle bacilli, but many club-shaped elements of actinomyces. Sections also showed the lesion to be that of actinomycosis.

Specimens Nos. 3 and 4 were similar in every way to both the above and showed the elements of actinomyces in both *smear and section* preparations.

Specimen No. 5 differed in no way from any of the others, so far as palpation and naked-eye appearance were concerned; but it was of exceptional interest, as it proved to be one of mixed infection; the *smears* showing a very few tubercle bacilli along with many forms of actinomyces.

In this case I found it quite impossible with the naked eye to distinguish between the tubercle nodules and those of actinomyces.

As all these cases were sent in as suspected tubercle specimens, and as the lesion to the naked eye differed in no perceptible way from that of tubercle, by the general routine macroscopic examination practised at the present time, cases of actinomycosis of the udder might readily be put down as being tubercular.

I feel confident from my experience in these cases that if each suspected tubercular udder were subjected to a microscopical examination the percentage of actinomycotic udders would be greater than is generally supposed.

It might also be mentioned that in the annual veterinary inspection of dairy herds I have examined over 500 samples of milk from different cows. Some of these samples taken from cows with what appeared to be marked tubercular lesion of the udder gave negative results on being subjected to animal inoculation. The question arises, Might these not be cases of actinomycosis?

During last winter's inspection a case occurred where the lesion of the udder was markedly nodular and similar to tubercle. A sample of the milk was taken and a guinea-pig inoculated, with negative result. Not satisfied with this result, samples were again taken from all four quarters of the same cow. These again proved negative on animal inoculation.

Smear preparations from these last samples made from the deposit of the centrifugalized milk showed a few acid-fast rod-shaped and a few fragments of club-shaped elements, suggestive

of actinomyces in those taken from both hind quarters and the left fore quarters.

I was unable to procure the udder for further examination, but am convinced it was a case of the disease.

In actinomycosis of the human subject, it is yet doubtful how infection takes place, as the cereal theory has been partly exploded, through cases arising which had no connection with grain, and I think it is just possible infection may be conveyed by the milk of such a cow, as I have just quoted, where the elements of the disease were found in the fluid.

If that be so, this disease as affecting the udder of the cow warrants more attention than is given to it at the present moment in connection with our milk supplies.

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THE MECHANISM OF LARYNGEAL ROARING.

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BEFORE one can proceed to discuss the mechanism of roaring due to paralysis of the left recurrent nerve in horses it is first necessary to consider the variations of the interior of the larynx during normal respiration. During normal inspiration the arytenoid cartilages are drawn outwards towards the wall of the larynx and by that action the vocal cords are also similarly approximated to the laryngeal wall, thus closing the ventricles which are then virtually only potential sacs, and perfectly free ingress of air is permitted.

During expiration the arytenoids and vocal cords are relaxed and the ventricles become actual sacs. This is of small importance as during that action the free edges are directed away from the direction of the air current. In this way then there is no impediment to the ingress or egress of air during normal respiration.

In roaring, however, due to paralysis of the left recurrent nerve, the intrinsic muscles attached to the arytenoid cartilage

of that side are functionless or almost so. Consequently the arytenoid of that side and its corresponding vocal cord are not drawn aside during inspiration and the left laryngeal ventricle remains open with the free margin somewhat loosely directed against the air current.

During rest or only slight exertion this obstruction may not cause any appreciable inconvenience as a sufficient supply of air is allowed without any increased action of the muscles of inspiration.

During work or forced exercise, however, a much larger supply of air is needed and force of the air current is greatly increased. It is then that the open ventricle becomes an obstruction, throwing even greater work on the muscles of inspiration. As a result the ventricle of the paralysed side becomes distended with air, and the air rushing into and out again round the now tense vocal cord produces the sound which, according to the pitch, we designate whistling or roaring. During expiration the air current, of course, is reversed and the ventricle presenting little or no obstruction no abnormal sound is produced. I am of opinion that there is no appreciable vibration of the vocal cord or arytenoid to produce the sound. It would also appear that the difference in the pitch of the sound is due to the degree of relaxation of the arytenoid and vocal cord. Where the dilators of the larynx are only partially paralysed, the ventricle is partially closed and the opening into it being more slit-like, a higher-pitched sound (whistling) is produced than when paralysis is complete and there is no degree of approximation of the vocal cord to the wall of the larynx, in which case the deeper note (roaring) is produced. The degree of respiratory distress corresponds directly with amount of obstruction during inspiration.

Now, if these views are substantially correct, it should be easy to understand how obliteration of the ventricle of the paralysed side should remove both the abnormal sound and the respiratory distress, either wholly or in part. The operation of stripping the mucous membrane lining the ventricle causes the sac to close permanently by the union of its two faces by cicatricial tissue and the main mechanical cause of the obstruction is removed, the vocal cord being firmly bound to the outer wall of the larynx.

I cannot see any advantage in obliterating the ventricles of

both sides of the larynx in unilateral paralysis, and I do not recommend it.

I may be asked to explain those cases in which the operation has conferred little or no benefit. I cannot pretend to explain them all, but I consider that most of the reported failures are due to a mistaken diagnosis, the roaring being due to one of the other numerous causes of roaring and not to paralysis of the left side of the larynx. In other cases, where it is certain there is no error of diagnosis, there is some improvement, but not as much as might have been reasonably expected. In some of those cases the ventricle has not been completely obliterated. That is to say, that in the exercise of the necessary caution not to remove too much mucous membrane, rather too little has been removed, and though the ventricle is closed in its depth, there is still a small sac or ledge at the side of the larynx. Moreover, another very important point must not be overlooked, namely, the dilators of that side of the larynx are still paralysed and some degree of obstruction to inspiration must still be expected. In view of the latter fact, it is remarkable that such good results as have been obtained in some cases could result from the operation.

I have heard it argued against the operation that since we do not know the true functions of the ventricles, we may be doing unknown harm to the patient. With regard to that point I have an easy conscience, since I consider that the functions of the ventricles are entirely bound up in the mechanism of vocalization, and the latter is of very small moment to horses in domestication. If that be the case, then there can be no harm in obliterating it.

A MALIGNANT BONE-DISEASE OF SHEEP (OSSEOUS CACHEXIA) IN NEW ZEALAND.

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AN outbreak of osseous cachexia, better known under the more common but less appropriate designation "osteomalacia," occurring as an enzootic affecting sheep, has been for the first time recorded in this country. This disease, which is usually confined to cattle, particularly milch-cows, is characterized by disturb-

ance of nutrition, leading to resorption of calcareous salts from the bones, which in consequence become soft and fragile. The factor chiefly responsible for this abnormal condition appears to be an excess of organic matter and deficiency of lime-salts in the soil upon which the animals are depastured.

Symptoms and Course of the Disease.—This process of demineralization of the bone is slow and insidious in its onset and course. At first only slight loss of condition may be noticeable, indicated by a ragged and unhealthy appearance of the fleece. The wool feels dry and harsh to the touch, has lost its lustre, and may be readily detached. This condition is followed by progressive emaciation. Affected sheep are listless, disinclined to move, lie for a considerable time, and rise with difficulty. When made to walk, they often appear lame, and in well-marked cases a creaking or cracking sound may be heard. Spontaneous fractures are frequent, and sheep may be found with a leg and several other bones of the body broken. Handling affected sheep is liable to lead to fracture of one or other bone. The broken bones do not heal readily, and, as a rule, on the *post-mortem* examination of a severe case, several old calluses may be observed along the course of the ribs, marking the site of former fractures. The bones themselves are extremely thin and light, having been converted into shell-like structures by the resorption of their lime salts. The marrow of the long bones generally is congested, hæmorrhagic, and often gelatinous. The osseous tissue itself appears to be exceptionally porous, and has undergone rarefication.

Microscopically, the changes in the bone are seen to consist of decalcification extending from the periphery, and conversion of the normal elements into a homogeneous matrix. The Haversian system, which has become almost obliterated, is seen to be surrounded by fibrous tissue. The medullary cavities are enlarged, and contain masses of myelocytes. Considerable formation of new, dense, osteoid tissue, which has not undergone calcification, can be observed particularly around the seat of former fractures.

In the case in point, Lincoln crossbred hoggets were affected, the mortality being 8 per cent. of the total attacked. They had been brought from a property on rich, limestone land—which may be designated as Property No. 1—and depastured on alluvial

flat and adjacent hill country (Property No. 2). In about ten weeks' time after their transfer the hoggets were seen to be going off in condition, and exhibited in varying degree the symptoms already described.

In company with Mr. B. C. Aston, Agricultural Chemist, I investigated the nature of the disease. Extracts from Mr. Aston's interesting and valuable report on the result of the chemical analyses of bones from affected animals and soil from the locality are appended. The report bears out the general characteristics of the disease. It is interesting to note that the analysis of the soil in the affected locality, in contrast to the soil of the locality upon which the sheep were formerly pastured, shows the latter to be six times as rich in phosphoric acid; while the result of the bone analysis of one of the diseased hoggets proves it to be correspondingly deficient in the proportion of normal bone salts.

Treatment should be based upon an attempt to return to the soil the diminished mineral salts. Phosphates and superphosphates as manure may be used with advantage. It has been observed that cattle affected with osteomalacia generally seek out and devour bones or shells containing lime, thus endeavouring by instinct to make good the deficiency. An allowance of bone-meal is therefore indicated in treatment, and every attempt should be made to change the diet, and give nourishing food rich in calcium salts, such as crushed oats, bran, oilcake, and chaff. Salt-licks may act as a wholesome tonic. Individual treatment is, as a rule, impracticable, but, should valuable stud sheep become affected, such remedies as cod-liver oil, iron, and arsenic may be administered in suitable proportion.

Following is an extract from Mr. Aston's report:—

Dominion Laboratory, Wellington, December 13, 1909.

C. J. Reakes, Esq., M.R.C.V.S., Director of Live-stock and Meat Division, Department of Agriculture, Commerce, and Tourists, Wellington.

Osteomalacia in Hoggets.

THE analyses of the bones and soil collected by me on my recent visit, with Mr. H. A. Reid, F.R.C.V.S. (Government Veterinarian), to the farms Nos. 1 and 2 of Mr. ——— are given on the attached sheets. The results are most interesting, and show

a marked decrease in the percentage of ash—the chief constituent of which is, of course, calcium-phosphate—as compared with the figures given by authorities for the bones of healthy animals.

Frèmy found in the lamb 67·7 per cent. bone-ash; of which 60·7 per cent. was calcium-phosphate, 1·5 per cent was magnesium-phosphate, 8·1 per cent. was calcium-carbonate.

In the sheep he found 70 per cent. of ash, of which 62·9 per cent. was calcium-phosphate, 1·3 per cent. was magnesium-phosphate, 7·7 per cent. was calcium-carbonate.

The different orders of mammiferous animals do not exhibit any essential differences in the proportion of inorganic matter in the bones, the limits being 64 and 75 per cent.

In osteomalacia the tribasic phosphate of calcium is said by Weber to be converted into the 3/8 phosphate ($8CaO\ 3(P_2O_5)$) and the bones sometimes contain a free acid. In the disease the proportion of mineral matter sometimes diminishes to such an extent that the bones bend under the weight of the body.

Marchant found in the femur of a rachitic child 72·0 per cent. cartilage, 7·2 per cent. fat, 14·7 per cent. calcium-phosphate, 0·8 per cent. magnesium-phosphate, 2·02 per cent. undetermined.

Charles gives the altered composition of bones (vertebra) in osteomalacia as follows: 13·25 per cent. phosphate of lime, 5·95 per cent. carbonate of lime; 0·90 per cent. phosphate of soda and sulphate of lime, 74:64 per cent. ossein, &c., 5:26 per cent. fat.

It will be seen that the amount of organic matter in this analysis is almost identical with the sample of vertebra analysed in this laboratory.

The composition of the bone-ash derived from the bones is normal; the only obvious abnormality in the analysis is the amount of ash when this is calculated on the fresh bones. This bears out the conclusions of Levy (Zeitschr. f. Physiol., Chem. 19), who found the normal relationship, $6PO_4\ 10Ca$, is retained in all parts of the bones in osteomalcia.

Cadéac, Leblanc, and Carougeau ("Principles of Veterinary Surgery"), writing on the composition of the soils upon which osteomalacia occurs, mention that Zundel attributes the disease to soils abounding in silicates, which, as a consequence, do not retain water. Hertwig, on the contrary, claimed that clay sub-

soils play an important part. They, however, point out that it is important to note that the disease may occur where the land is rich in calcium-carbonate *and poor in phosphoric acid.* Yogow has attributed the disease to a dearth of calcareous salts in the water supply, and Rossignol, who observed it in animals fed on the by-products of distilleries and sugar-refineries, blamed the poverty of these feeds in phosphates. The character of the soil affects the nutritive value of its flora. The influence of droughts on vegetation has often been responsible for the disease, as it leads to the growth of feeds having a dearth of nutritive elements, especially of salts, which, lacking water as a conveyance, remain incorporated in the soil. The use of phosphates and superphosphates as manure has given good results, according to the authors. The use of fodder obtained from districts where the disease is unknown is also advisable.

In thus summarizing the statements and quotations of this work on veterinary surgery I would point out that the water might be analysed for calcium-salts; but analyses of the soils do not show that calcium-carbonate in the soil is less on the affected than on the healthy country. The liability of country to suffer from drought is certainly greater on the former than on the latter, and is a point worth bearing in mind.

In travelling across the country one cannot but be struck by the difference in the soil and its natural covering at Property No. 1, where the sheep were bred, and at and beyond Property No. 2, where the disease developed. At No. 1 the underlying rock is a soft limestone, and the surface soil an easily-worked loam. The original flora is mixed forest, containing great trees and shrubs one usually finds growing on rich soil. On the affected area the natural covering is manuka, tauhinu (Pomaderris), and rushes, plants usually found growing on poor, dry soil. The difference in the rainfall (including the number of rainy days) must be considerable. I wish to lay stress on the difference in the two types of country, as it appears to me that the sudden change from a rich to a poor soil may have been the largest, if not the sole, factor in the occurrence of the disease.

Considerable time was spent by the owner and myself in taking samples of soil from different sites on his affected block of country. Samples were taken from the tops of high flats and from the valleys. There is very little difference in the results of

analyses of these samples: they are not abnormally different in plant-food content from many of the soils on which sheep are successfully grazed throughout the Dominion. When, however, we examine the analysis of the No. 1 (home farm) soil, the striking fact that it is tremendously rich in available and total (hydrochloric-acid extract) phosphoric acid at once becomes apparent. The quantity of this mineral nutrient available is six times as great as on the affected soils. The total quantity present is at least three times as great.

Following are details of analyses.

B. C. ASTON, F.I.C.,
Chief Agricultural Chemist.

ANALYSES OF BONES.

	Ribs. Per cent.	Tibia. Per cent.
Water	24·81	—
Analysis of water-free bones :—		
Organic matter...	71·92	59·56
Ash	28·08	40·44
Analysis of bone-ash :—		
Tricalcic phosphate (Phosphoric acid (P_2O_5) ...	39·28	39·10
Tricalcic phosphate (Calcic oxide)	46·60	46·15
Calcic carbonate	11·10	11·35
Magnesic-phosphate	0·60	0·50
Silica	0·40	0·50
Iron, alumina, &c.	1·55	1·80

Normal bone-ash (Merillat) :—	Per cent.
Tribasic phosphate of lime	85·87
Tribasic phosphate of magnesia	1·70
Carbonate of lime	8·10
Fluoride of lime	0·35
Chloride of sodium	0·23

Total analysis of bones dried at 100° :—	Ribs.	Tibia.
Organic matter	71·92	59·56
Phosphate of calcium	24·01	34·44
Phosphate of magnesia	0·16	0·20
Calcic carbonate	3·10	5·01
Silica, &c.	0·11	0·20
Iron, alumina, &c.	0·45	0·72

	Per cent.
Percentage of P_2O_5 in tribasic phosphate	45·80
,, ,, $\frac{3}{8}$ phosphate	48·80
,, ,, phosphate of bone (L869-70)... ...	45·58

The phosphate is tribasic, and not $\frac{3}{8}$ phosphate.

Analysis of vertebra of hogget :—	
Organic matter...	80·50
Mineral matter...	19·50

Results of Soil-analysis.

—	Property No. 1				Property No. 2				Where hoggets were bred
—	L 841	L 842	L 843	L 844	L 845	L 846	L 847	L 848	L 849
	Composite Sample of L 841-46								
Soil	Easily friable; brown sandy clay								Friable; brown, fine, sandy clay
Residue on washing	Small; rock-fragments containing quartz, hornblende, and ferruginous particles								Same as composite sample.
Capillarity	Fair								Good.
Capacity for water	Fair								Excellent.
Reaction to litmus	Faintly acid								Neutral.
Mechanical analysis—	Per Cent.								Per Cent.
Coarse sand	2·0								3·0
Fine sand	51·0								66·1
Silt	10·4								6·0
Fine silt	13·1								7·9
Clay	22·3								14·5
Moisture, &c.	1·2								2·5
	100·0								100·0
Chemical analysis—	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Moisture	1·720	2·060	2·780	3·180	1·940	3·280	3·400	3·380	6·560
Organic matter and combined water	3·120	5·120	6·430	6·200	5·040	6·680	6·240	4·200	11·870
Total nitrogen	0·158	0·213	0·262	0·240	0·170	0·186	0·185	0·122	0·494
Available potash (K_2O)	0·015	0·008	0·015	0·009	0·015	0·010	0·024	0·008	0·024
Phosphoric acid (P_2O_5)	0·021	0·023	0·016	0·020	0·009	0·011	0·007	0·006	0·068
Colour of citric-acid extract on ignition	Brown	Brown	Light brown	Red brown	Greyish brown	Khaki	Light brown	Khaki	Red
Hydrochloric acid extract—									
Lime (CaO)	0·300	0·350	0·160	0·410	0·120	0·120	0·250	0·150	0·300
Magnesia (MgO)	0·380	0·420	0·470	0·240	0·200	0·200	0·310	0·250	0·460
Potash	0·190	0·150	0·160	0·240	0·140	0·130	0·210	0·100	0·310
Phosphoric acid	0·100	0·100	0·070	0·090	0·090	0·120	0·060	0·050	0·340

Clinical Articles.

SPLINTS FOR A HORSE'S NECK.

By T. SALUSBURY PRICE, M.R.C.V.S.
Kennington.

I EXPECT the difficulties I have met with in the treatment of torticollis in horses have also been encountered by other practitioners and that is my reason for recording a method of dealing with those cases which I have found very satisfactory.

Splint for Horse's Neck.

The cases usually result from some accident, such as a fall, and the neck becomes bent towards one side. Sometimes you can forcibly straighten it, only for it to recur immediately. Moreover, the horse is unable to raise his head, which sometimes becomes enormously swollen and œdematous, and the skin of the muzzle abraded by resting on the floor. Under such conditions it is also impossible for the horse to feed and drink. In my opinion the case is usually partial luxation of the cervical vertebræ and severe muscular strain.

The treatment I have adopted with surprisingly successful results in a number of cases recently is to apply splints to the neck, as shown in the accompanying photograph. The splints were made for a larger horse than that to which they were applied for purposes of taking this photograph. There are two splints, shaped to the neck, and attached to each other above and below the neck with two fairly long bolts on the thread of which are thumb-screws. Before applying the splints I wrap several yards of thick flannel round the horse's neck. His head is then held up and the splints applied by removing either the upper or lower bolts. They are then tightened up with the thumb-screws fairly tight, the flannel preventing undue local pressure and any necrosis of the skin. The screws are slightly tightened from day to day. When properly applied, the head is held up automatically and œdema prevented, and the horse usually drinks and feeds easily. As will be seen in the photograph, the horse rests his chin on the front lower bolt and the other lower bolt rests across the front of the shoulders. If it is thought that that support is not sufficient a cord may be attached to the front upper bolt and passed over a beam. It is also wise to put the horse in slings.

In about three weeks the apparatus can be removed and it is gratifying to see that the neck is quite straight again and the patient can raise and move his head about quite normally.

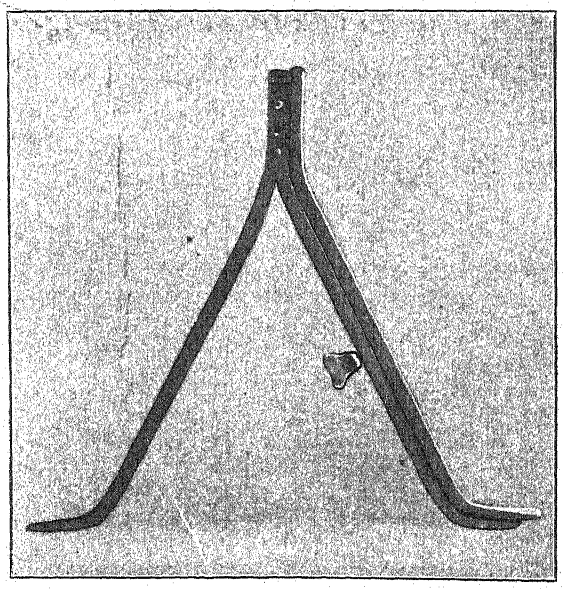
A PORTABLE FOOT-REST FOR HORSES FOR THE TREATMENT OF FOOT AFFECTIONS.

By T. SALUSBURY PRICE, M.R.C.V.S.

Kennington.

One of the greatest difficulties I have met with in the course of many years' practice has been in connection with horses' feet and the thorough dressing of them when affected with such diseases as quittor, &c. The horse, as a rule, is so fidgety that proper dressing is a very tedious matter. I have found that the old farrier's horse foot-rest, which we call the "lazy-boy," is a most useful instrument for holding the foot, whether it be a hind or a fore foot. The instrument is rather cumbersome to carry about in a trap, being a fixed tripod, and so I have had one made, as shown in the photographs, that can be carried about with

Foot-rest in Use.



Foot-rest closed for Portability.

ease. It simply has a detachable leg, which fastens on by two fixed bolts, and a thumb-screw for use. When not in use the detachable leg can be removed and screwed on to one of the other legs and so will be perfectly flat on the floor of the trap or other conveyance. The "lazy-boy" is also very useful to raise a foot forward for the purpose of clipping coronets, pasterns, and fetlocks.

When in use the instrument is kept steady by one's foot, and if the horse's leg is fully extended, it is remarkable how steadily he holds it, and the whole operation of dressing is much facilitated.

FRACTURE OF FOURTH AND FIFTH SACRAL, AND FOURTH, FIFTH, AND SIXTH LUMBAR VERTEBRÆ IN THE HORSE.

By J. A. NICHOLAS, Captain, A.V.C.

In charge 16th Lancers, Norwich.

The horse in question was being ridden in a point-to-point race at Finningham, Suffolk, when about half-way round the course he caught his hind legs in the ditch on the landing side of the jump. After this he appeared to be going rather badly and made similar mistakes at the remaining fences, especially at the last fence but one, where he practically stopped; but his rider pushed him on again and put him over the last fence. Here the horse appeared practically done and its rider then dismounted. The horse was walked to the railway station (a distance of nearly five miles), the horse falling once on the journey when within a mile of the station, but was able to rise without assistance.

On arrival at Norwich he was walked from the station to the stable (a distance of about a mile); he appeared very stiff about the hind quarters during progression. He was watered and fed. Urine and fæces passed normally.

With the exception of great tenderness about the loins (which the owner thought was a sprain of the muscles in this region) he appeared well enough. This was at 10 p.m. About 3.30 a.m. he fell down and was unable to rise. I was sent for and found the horse showing the following symptoms:—

Complete paralysis of the hind quarters, occasional violent

movements of head and fore limbs; and as the groom described to me, "trying to bite anyone near him." Rectal mucous membranes hot, and hand passed into rectum with difficulty. Conscious.

I informed the owner of the hopelessness of the case, and sent for the cattle-killer, but the horse died before its arrival (5 p.m.) from internal hæmorrhage.

Post-mortem examination revealed: Longitudinal fracture of the spine of the 4th sacral and body of the 5th sacral vertebræ; fracture of spines of 4th, 5th, and 6th lumbar; fracture of transverse processes of 5th and 4th (near side) lumbar; fracture of neural arches of 4th and 5th lumbar, exposing the spinal cord. Quantity of blood in abdominal cavity, rupture of right kidney and post. aorta.

SINUSES IN AND ABOUT THE WITHERS AND THEIR TREATMENT.

By W. STAPLEY, M.D., D.V.Sc., M.R.C.V.S.
Professor in the Melbourne University Veterinary School.

So-called fistulous withers is a common disease in and around Melbourne. From anatomical reasons a fistula of this area is well nigh impossible. Fistula is a surgical term used to express an abnormal opening of some permanency, between normal cavities or canals, or between such cavities and the surfaces of the body. The word sinus means a persistent suppurating tubular tract in the tissues, with but slight tendency to heal, such as is left after the spontaneous opening of an abscess.

Sinuses of the withers do not heal because the sinuous tubes do not afford perfect drainage to the infected tissues. The mucous bursæ and the yellow elastic tissue of the ligamentum nuchæ are tissues that are most difficult to rid of infection. Yellow elastic tissue is practically avascular, and further it is slow when surrounded by pus to become broken down and thus to disappear. It is a tissue resistant to digestive processes.

The cause of sinus of the withers of course is infection. The damaging influences that afford a suitable nidus for infection are probably many. I shall not deal with them exhaustively but imperfectly, as occurring to me in a general way and not as the result of directed observation or inquiry. Australian and New

Zealand horses are brought in from work and turned into a paddock for a roll before being fed. This custom adds to the comfort and happiness of the horse. From time to time horses bruise their withers during rolling. I am not prepared to advance any speculative remarks that the gain to health horses may derive from the habit of rolling compensates the risk they run of bruising their withers, any more than I am prepared to assert that the gain of health to boys compensates the risks they incur by playing football. It is as difficult to stop horses rolling as it is to stop boys playing football. I have no desire to reform these habits.

A bruise of the withers in the region of the bursa that minimizes the friction between the funicular portion of the ligamentum nuchæ and the spinous process results in what with licence may be termed a synovitis—a synovitis that lacks the influence of articular cartilage as exists in a true joint. If rested the synovitis abates and the bruised tissues again become normal. If the area be further bruised by harness and infection be, as it were, rubbed in through the skin, an abscess results. Thus a dissecting abscess occurs in and about such specialized tissues as the ligamentum nuchæ and its bursa. With the further developments that occur in these cases it is an easy matter to classify this surgical condition thus:—

(*a*) Synovitis of the bursa.

(*b*) Dissecting abscess of the bursa and the contiguous tissues.

(*c*) Sinus formation. Hyperplasia of connective tissue, areas of tissue waterlogged with œdema, areas of tissue dead or tissue that is dying and very sensitive.

(d) Complicated cases that have involved the thoracic spines or extended by wide tissue destruction to distant tissues.

A synovitis of the withers should not be opened, but it should be treated by rest. Infected cases must be opened freely. There is only one incision that gives free access to the area of disease. It is a line parallel to the vertebral border of the scapula, midway between it and the supraspinous ligament. At the cephalic border of the scapula, the incision is extended downward and forward at an angle of 45° for several inches. This incision severs skin, deep fascia, and the trapezius muscle. The trapezius is wounded for the advantage of free access to the disease. This long incision lays bare the region of the bursa and the rhomboïd muscle. It undoubtedly has great advantages over any other incision.

Vertical incisions afford no space in which to attack the diseased tissue. It is to be regretted that in this day of advanced surgical method from time to time accounts of injection methods of treatment appear in the journals. Such treatment is not surgical. It is a destructive hit or miss shot of irritating fluid fired into hidden tissues. It is a fortunate fact that recovery does follow any or no method of treatment in a certain number of cases. We are not concerned with that phase of disease. Surgery is founded on definite principles, one of which is: No more tissue shall be destroyed than the case demands and such destruction shall be under the control of the knife. We recommend the destruction of the trapezius muscle by the knife because that muscle blocks the way of the surgeon to the diseased area, and it should be remembered the trapezius is a muscle of very little use to the horse.

I would add that this incision has been adopted by several Melbourne practitioners with very successful results.

COUNTER-IRRITATION AS A DIAGNOSTIC AGENT.

By R. FERGUSON STIRLING, M.R.C.V.S.
Horsley Woodhouse, Derbyshire.

I REMEMBER when I attended lectures delivered in Ireland by one of the Editors of this Journal, he carefully placed before his students the advantages and disadvantages of the use of counter-irritation in pulmonary disorders. As far as I can remember the disadvantages had it. He preferred hot blankets. Since then in the medical and veterinary journals and papers opinions have varied largely. The sequence, as far as I can recollect, in the medical papers was somewhat like this. No counter-irritant, cold water applications, ice bags, hot water applications; and in the various parts of the country you find men who are practising one of these various methods.

Now, I myself am quite open to conviction on the subject of the use of counter-irritation as a curative agent, as owing to my limited experience and the multitude of opinions I am not able to satisfy myself up to the present as to which of the many sides I am a humble adherent.

But this I do wish to put forward in the hope that I may be either established in my opinions or corrected.

During my time in practice I have frequently been called to cases in which the symptoms pointed rather to pulmonary trouble, but which were most distressingly vague.

Often all you can discover is that the animal is "off colour," temperature raised, pulse not greatly altered, some slight blowing, and a definite dullness over some portion of the pulmonary area. Now it is this dullness that baffles me—it is often so indistinct and so limited in extent that one wonders if there is any difference in sound at all. In such cases I apply mustard to the dull area—sometimes not larger than a saucer in a horse or cow. In twelve hours, or even sooner, I have always found that if there was any pneumonia one could distinguish it quite easily before one got the pneumonic pulse and the other evident symptoms.

I take it that in these cases the pneumonia has been what one might call a central pneumonia and that the reason for the indistinct nature of the sounds heard on auscultation was simply the distance these sounds were from the ear when applied to the thoracic wall. We have all heard of cases where a patient has been attended for some other disease and then days afterwards pneumonia had appeared in a very aggravated form. What was the reason? Was it because the pneumonia remained central for some little time and the symptoms other than those thoracic had been vague and misleading?

Why the mustard so acts to produce the increased pneumonic sounds or bring them nearer to the ear I shall not attempt to explain, I simply state my experience for what it is worth in the hope that it may be of service to some other young practitioner, who, like myself, feels there is so much yet to be learned.

AN UNUSUAL FOSTER-MOTHER.

By R. A. PHILP, F.R.C.V.S.
Brentwood.

The accompanying photograph shows a rather unusual case of a heifer acting as foster-mother to two lambs. The two lambs are orphans, and when three days old they got into a shed with a newly-calved heifer and commenced sucking her of their own accord. She did not mind them in the least, but took very

Heifer Suckling Lambs.

kindly to them and suckled them along with her own calf. The latter was the only one who disagreed with the arrangement, and it was rather amusing to see how he butted the lambs out of the way when he wanted his meals.

The third lamb in the photograph has nothing to do with the case.

UNEXPLAINED MORTALITY AMONGST BIRDS.

By T. G. PALGRAVE, M.R.C.V.S.
Department of Agriculture, New South Wales.

On February 24, 1911, I received a message from Mr. Le Soeuf, Curator of the Zoological Gardens, Sydney, New South Wales, asking me to visit the Gardens as soon as possible.

On reaching the Gardens about half an hour later, I was informed by Mr. Le Soeuf that a wild duck and a pelican had died, and that a swan, a pelican, and a wild duck were very sick, the swan and the pelican being almost *in extremis*.

All the birds referred to above, together with several wild geese and other species of wild duck, were kept in a grassy

enclosure, well sheltered by trees and long grasses, and having an ample sheet of artificial water, which water appeared of excellent quality within the enclosure.

The birds within this enclosure are fed on biscuit softened in water, the biscuit being good and fresh, and on fish which is also obtained fresh as required.

Though the fish is, of course, the food of the pelicans, yet the other birds will often gobble a morsel when they can get it.

The first pelican—whose carcase had been removed—died on February 23, and it was then that the other birds were observed to be sick.

The symptoms observed were the same in all the cases, namely, vomiting, purging, the excreta being dirty green in colour, and a limited paralysis of the legs, the birds being able to swim feebly, but being quite unable to stand; all food was refused, but there was no abnormal thirst. In the cases of the pelicans there was marked emphysema of the necks before death.

Mr. Le Soeuf informed me that a careful search had been made through the enclosure on the chance of finding something in the shape of debris of food or any material which might account for the cases of illness, but all that was found was some fragments of what are commonly known as "puff-balls," a species of fungus, and these fungi had evidently been partly eaten, presumably by the birds in the enclosure. It appeared both to Mr. Le Soeuf—who I should mention is a graduate of the Melbourne Veterinary College—and myself that the treatment indicated was antiseptic and stimulant, and though we had little hope of a successful result, we administered to the swan and the pelican two minims each of liquid carbolic acid, and half a dram each of whisky, in half an ounce of water each. The sick duck was in the centre of the sheet of water and all efforts to secure it proved unavailing. The swan—which was of the white variety—and the pelican weighed, roughly, about 40 lb. each. I need hardly say that the treatment mentioned was only emergency treatment, having no other suitable drugs at hand. The swan and the pelican had been laid in the shade inside an enclosure fenced with corrugated iron and out of sight and reach of the public. As already mentioned, these two birds were practically *in extremis* when we dosed them, and they died within three hours.

We made *post-mortem* examinations on the wild duck which had died prior to my arrival, the swan, and the pelican, with the following results:—

Wild Duck.—Intestine normal, lungs emphysematous and containing a good deal of sanguineous fluid, auricles of heart much dilated and full of dark clotted blood, liver normal.

Pelican.—Stomach normal, intestine showing slight inflammation, but not enough to account for death, lungs emphysematous and full of sanguineous fluid, heart normal, liver normal, carcase very fat and flesh dark coloured and flabby, having a sodden appearance, marked emphysema of tissues of neck and breast.

Swan.—Intestines, liver, lungs, gizzard, and heart normal.

On conclusion of these three *post-mortem* examinations an attendant informed Mr. Le Soeuf that he had caught the sick duck, which we had been previously unable to secure. We therefore decided to take it to the Government Bureau of Microbiology for examination.

On the following morning this duck was alive at the Bureau, and on my calling there, Dr. J. Burton Cleland, M.D., and Mr. T. Harvey Johnston, B.Sc., who had the investigation in hand, decided to chloroform the bird and make a *post mortem*. I wish here to express my appreciation of the courtesy shown, and the trouble taken by these gentlemen in the matter. The results of the *post mortem* were as follows:—

Intestine slightly inflamed, but not sufficient to cause death; lungs emphysematous and containing some sanguineous fluid; liver normal; gizzard normal; heart, both auricles greatly dilated and full of dark clotted blood. In this and the three previous cases the intestine contained a small quantity of greenish fluid fæcal matter.

The blood, fæcal matter, and contents of gizzard were submitted to microscopical examination with negative results.

The gizzards in all cases were almost empty and the stomach of the pelican quite so. The only conclusion I could come to was that these were all cases of ptomaine or fungus poisoning, probably the latter. The slight inflammation of the intestinal tracts and the apparent absence of pain when the birds were observed to be sick, would appear to negative any idea of an irritant poison, especially when we remember that other birds in

the same enclosure and feeding out of the same receptacle for food have remained healthy.

The *post-mortem* appearances also point more to fungus than ptomaine poisoning, as the latter is generally characterized by more signs of enteritis than appeared in these cases. The excessive dilatation of the auricles of both ducks examined is a curious feature, but it is not easy to say what bearing—if any—it had on those two cases. The duration of the illness appears to have been very short, the swan and pelican having died within twenty-four hours of having been observed to be affected, and had the duck, which was taken to the Bureau, not been chloroformed, it would nevertheless have in all probability died very shortly, as it was almost dead at the time it was killed.

All the other birds within the enclosure in which these birds were kept have remained perfectly healthy.

They (the others) are various species of wild duck and wild geese.

I am in hopes that some other member of the profession has observed a similar condition elsewhere and may be able to throw some light on the matter.

It is regrettable that so little has been written on the subject of avian pathology.

Canine Clinical Note.

CYSTIC METRITIS IN THE BITCH.

By GEO. H. WOOLDRIDGE, F.R.C.V.S., M.R.I.A.
Professor in the Royal Veterinary College, London.

Some three years ago (1908) the attention of veterinary surgeons in this country was drawn by several writers to the occurrence of a form of chronic metritis in the bitch. As was pointed out then, the condition is by far the most common in aged bitches that have never been in whelp, though it is occasionally met with in young bitches and sometimes in aged bitches that have bred at one time, but not for some years. All breeds appear to be equally susceptible. The condition would appear to be getting much more common, so much so that it gives one the impression that contagion may possibly account for it, though

it is difficult to see how it is spread in bitches known definitely to be virgin bitches.

The more common symptoms are: Vaginal discharge of a yellowish-grey or chocolate-brown viscid material in varying quantities, sometimes only noticeable by the fact that the bitch leaves a moist spot where she sits. The abdomen has a varying degree of distension depending on the freedom of discharge or otherwise, the distension is bi-lateral and bulging particularly along the lower half of the abdomen, giving the appearance in bad cases of an advanced stage of pregnancy.

In some cases the vaginal discharge is slight, but more or less continuous from the outset and the distension may be absent. There is occasional vomition and I have known gastritis erroneously diagnosed as a consequence. The appetite is usually good in the earlier stages, but later becomes capricious, and in prolonged cases the patient becomes emaciated and may succumb to exhaustion. The temperature is scarcely ever elevated, but may be subnormal in the advanced stages.

In my experience the only satisfactory treatment is excision of the womb and the earlier it is done the better, as the recuperative powers are quite good then and the patient generally makes a rapid recovery from the operation. If the condition is allowed to go on too long, however, the patient becomes a very bad subject for so severe an operation.

When the womb is opened afterwards it is seen to contain a varying quantity of purulent material either yellowish-grey or chocolate coloured, which contains enormous numbers of streptococci, staphylococci, and long and short bacilli. In a case I recorded and illustrated in the VETERINARY JOURNAL of September, 1908, in a small fox-terrier bitch, weighing only 11 lb., the weight of the uterus was proportionately enormous, viz., 2½ lb. The mucous membrane varies in appearance. In some cases it is smooth and quite pallid; in some it is corrugated or thrown into folds, and I have recently met with four cases in which a cystic condition existed and which is responsible for the penning of this note. In some cases the ovaries contain cysts and in others they appear quite normal.

The four cystic cases referred to have all come under my observation during the past month, a circumstance which appears to me somewhat remarkable considering the fact that I have not

previously met with a single instance of it amongst the large number of wombs I have excised and examined. Nor have I seen any record of similar cases. They are as follows:—

Case I.—A twelve-year-old collie bitch that had never been pregnant and, so far as the owner knew, she had never been "lined." She had been ailing for several months prior to being brought to the college clinique on March 17, and as she had got very weak the owner preferred to have her destroyed, which was done accordingly. On making a *post-mortem* examination the uterus was found to be distended to the thickness of a sausage. When opened a greyish viscid exudate was seen. The mucous membrane was quite pallid, almost white, and innumerable cysts extended from the Fallopian tubes along each horn to the body of the uterus. The cysts varied in size from a lentil to a haricot bean and contained a clear serous liquid. They were so numerous that it would have been impossible to place the butt-end of a lead pencil on the surface without coming into contact with a cyst. Both ovaries were cystic, the right one bearing two cysts almost as large as walnuts.

Case II.—An eight-year-old Aberdeen terrier in very fat condition. The bitch was brought under observation in conjunction with Mr. W. Lothian, M.R.C.V.S., of Duns, on March 19, but permission to operate was not obtained until April 1. On that date the womb was removed, the patient being anæsthetized by morphia tart. gr. iss., and a little chloroform after forty-five minutes. In this case the uterus was almost empty, containing only a little greyish exudate. The left horn, however, was very intensely congested along its whole length, and the right horn only along its anterior half. Both horns carried numerous cysts, as in Case I, except that a few of the cysts had hæmorrhagic contents, while the rest contained a clear serous liquid. The ovaries were normal. The bitch has made a perfect recovery.

Case III.—A fat fox-terrier bitch, aged 9 years; she had been vomiting occasionally and discharging per vaginam. She was operated upon on April 21, under morphia and A.C.E. mixture. Both horns contained innumerable very small cysts, none of which exceeded a lentil in size. At the time of writing the bitch is doing well.

Case IV.—The uterus of an aged Great Dane bitch, removed on April 21 by my colleague, Professor Woodruff. The condi-

tion closely resembled that in Case II, being hæmorrhagic but involving both horns and also containing numerous cysts.

Case V.—This case was not cystic, but the uterine mucous membrane presented a mass of coarse villus-like projections. The contents were hæmorrhagic and the ovaries normal. The subject was a cross-bred toy pomeranian, seven years old, in good condition, but the uterine discharge was unusually offensive in odour. She was operated upon on April 19, and is making excellent progress at the time of writing.

On reflecting over these variations, I am of opinion that it is the same disease in all cases, but in these five the cases were diagnosed somewhat earlier than others. In other words, I think it probable they indicate an earlier phase of the chronic metritis.

ROYAL (DICK) VETERINARY COLLEGE, EDINBURGH.

Dr. O. Charnock Bradley has been appointed Principal of the above institution in succession to Professor Dewar, who has resigned. Professor Gofton has been appointed to the chair of Medicine, and the chair of Surgery and Obstetrics thus becomes vacant.

PROFESSOR BRADLEY.

The Governors of the Royal (Dick) Veterinary College are to be congratulated on their choice of Dr. Bradley as Principal. In fact, it would be very difficult to find anybody else who is in any way so well adapted for the position at the present critical stage in the history and development of the Institution.

Professor Bradley was born in Lancashire and commenced his studies at the New Veterinary College, Edinburgh, under the late Principal W. Williams, in 1889, and was admitted a Member of the Royal College of Veterinary Surgeons in 1892. He was then appointed Professor of Veterinary Anatomy in his Alma mater, a position he held until 1900. In that year he was appointed to the chair of anatomy at the Dick College in succession to Professor Mettam on the latter's appointment as Principal of the Royal Veterinary College of Ireland. Dr. Bradley still retains that chair and will continue the duties of his two offices.

In 1900, Professor Bradley obtained the medical degree, M.B., Ch.B. of the Edinburgh University, and as well-earned rewards for research and theses on the development of the brain and liver respectively he obtained the degrees of D.Sc. in 1905, and M.D. in 1907.

Reports.

THE CONTROL OF BOVINE TUBERCULOSIS.

THE following is a portion of the Report of the International Commission on the Control of Bovine Tuberculosis appointed by the American Veterinary Medical Association. The members of the Commission are: Wm. C. Edwards, J. N. Hurty, E. C. Schroeder, J. J. Ferguson, J. R. Mohler, T. W. Tomlinson, J. W. Flavelle, V. A. Moore, F. Torrance, W. D. Hoard, Mazyck P. Ravenel, Chas. A. Hodgetts, J. G. Rutherford (Chairman), M. H. Reynolds (Secretary).

In view of the *personnel* of the commission as selected by the American Veterinary Medical Association, and of the fact that so much information on the subject has been made available through the work of similar bodies in other countries and the researches of scientific and practical men in America and elsewhere, the commission has not deemed it necessary to take any evidence either from expert witnesses or others.

The members fully understood that the purpose which their appointment was intended to serve was less the acquisition of new knowledge regarding bovine tuberculosis than the careful study of the knowledge already available and of the thoughts and opinions of those most entitled to speak with authority on the subject.

The conclusions reached in this report are therefore simply the outcome of an earnest and thoughtful consideration of the various modern aspects and phases of the problem, with the object of crystallizing public opinion and so clearing the way for legislative action. They realized also that they could deal with fundamental principles only, and that the details of any policy which they might outline must in each case be worked out by the duly authorized and responsible representatives of the community immediately concerned. They nevertheless deemed it essential to study closely the history of the various efforts hitherto made by such countries throughout the world as have attempted to legislate on the subject. This naturally led to the gradual elimination of all methods other than such as might reasonably be adopted by any community desiring, in the full light of present-day knowledge, to undertake the control of bovine tuberculosis.

It was felt, in view of the prevalence of the disease, especially in some localities and among certain classes of cattle, the difficulty of providing a sufficient number of trained officials, and the large economic questions involved, to say nothing of the enormous expenditure, that it would be unwise, for the present at least, to discuss seriously a policy of universal compulsory testing and slaughter. Such a policy might perhaps be adopted with advantage by a small community, or one in which the disease existed to a very limited extent; but, speaking generally, especially in view of past experiences in this line, it was thought better to omit it entirely from the recommendations of the commission.

All other methods of dealing with bovine tuberculosis which have been recommended or tried in various communities were

thoroughly discussed, with the object of discarding weak points and adopting such features as might be deemed worthy of a place in the official findings of the commission. Every phase of the subject was in this way fully and freely considered, it being thought best to cover the whole ground as completely as possible before coming to a definite decision on any one point. In order to minimize still further the risk of omitting from the deliberations of the commission any phase of the question, four committees were appointed at the first meeting to deal respectively with—

(1) Education and legislation.
(2) Location of tuberculosis.
(3) Dissemination.
(4) Disposition of tuberculous animals.

The appointment of these committees proved to be of the greatest possible value in concentrating the energies of the various members on those branches of the subject with which they were most familiar, and their reports presented at subsequent meetings enabled the commission to reach satisfactory conclusions much more rapidly than would otherwise have been the case. As a means of furnishing information as to the reasons for these conclusions and the manner in which they were reached, the commission would recommend that the reports of the committees should be published as an appendix to this report.

The commission recognizing, after careful study, that the tuberculin test is the fundamental factor in any policy having for its object the control of bovine tuberculosis, decided that a pronouncement to that effect should properly occupy a foremost place.

Based on the information contained in the reports of its committees and on such other information as was brought out in the general discussions of the commission, the following resolutions were adopted for presentation to the American Veterinary Medical Association:—

Resolution I.—*Dissemination.*—As a general policy to be observed, all contact between tuberculous and healthy cattle and between healthy cattle and stables, cars, &c., which may contain living tubercle bacilli should be prevented. To accomplish this the following specific recommendations are made:

(1) There should be no sale or exchange of animals affected with tuberculosis except for immediate slaughter or for breeding purposes under official supervision.

(2) That the management of live-stock shows should give preference to cattle known to be free from tuberculosis, either by providing special classes for such cattle or in some other practical way, and should also take every precaution to prevent contact between such animals and those not known to be free from disease.

(3) All live-stock shippers should take every precaution to see that cars furnished are thoroughly cleansed and disinfected before use.

Resolution 2.—Tuberculin Test.—(1) That tuberculin, properly used, is an accurate and reliable diagnostic agent for the detection of active tuberculosis.

(2) That tuberculin may not produce a reaction under the following conditions: (*a*) When the disease is in a period of incubation; (*b*) when the progress of the disease is arrested; (*c*) when the disease is extensively generalized. The last condition is relatively rare and may usually be detected by physical examination.

(3) On account of the period of incubation and the fact that arrested cases may sooner or later become active, all exposed animals should be retested at intervals of six months to one year.

(4) That the tuberculin test should not be applied to any animal having a temperature higher than normal.

(5) That any animal having given one distinct reaction to tuberculin should thereafter be regarded as tuberculous.

(6) That the subcutaneous injection of tuberculin is the only method of using tuberculin for the detection of tuberculosis in cattle which can be recommended at the present time.

(7) That tuberculin has no injurious effect on healthy cattle.

Resolution 3.—Evidence from Tuberculin Test.—That a positive reaction to tuberculin in any properly conducted test, official or otherwise, in any animal in any herd shall be considered evidence sufficient upon which to declare the herd to be infected.

Resolution 4.—Compulsory Notification.—That this commission recommends the passage of legislation providing for the compulsory notification by owners and by veterinarians of the existence of tuberculosis in a herd, whether such existence be made known by detection of clinical cases or by the tuberculin test.

Resolution 5.—Location through Slaughter.—This commission recognizes that the discovery of tuberculosis in animals slaughtered for food purposes furnishes one of the best possible means of locating the disease on the farm, and therefore recommends the adoption of some system of marking, for purposes of identification, all cattle three years old and over, shipped for slaughter.

As tuberculosis of hogs is almost invariably due to bovine infection, this recommendation should also be made to apply to hogs of any age shipped for slaughter.

It is further recommended that the discovery of tuberculosis in animals coming under Government inspection should be used, whenever identification is possible, as a means of locating infected herds and premises. All such cases should be reported to the proper authorities for control action.

Resolution 6.—Disposition of Tuberculous Animals.—(The Commission Plan.)—(1) As a general policy in the eradication of tuberculosis the separation of healthy and diseased animals and the construction of a healthy herd are recommended. In order to accomplish this the following recommendations are made: (i) If the herd is found to be extensively infected, as shown by the tuberculin test or clinical examination, even the apparently

healthy animals in it should be regarded with suspicion until they have been separated from the reacting animals for at least three months. If after the expiration of this time they do not react to the tuberculin test, they may be considered healthy and dealt with accordingly. It is recommended that a herd extensively infected should not be treated by the method of general separation, but that the construction of a new herd from the offspring only is advisable. (ii) If the herd is found by either or both of the above methods to contain a relatively small proportion of diseased animals, separation of the diseased animals from the healthy animals and the construction of a sound herd from the healthy animals and the offspring of both are advocated.

As a working basis in carrying out these principles, we advise: (*a*) That herds containing 50 per cent. or more of diseased animals be treated as coming under section (i); (*b*) that herds containing under 15 per cent. of diseased animals be treated as coming under section (ii); (*c*) that herds falling between these figures be graded according to the option of the owner; (*d*) that it shall be the prerogative of the owner to reject either plan and have his herd dealt with by removal and slaughter of diseased animals, with or without compensation, according to the public policy in operation.

(2) That when by any means the officials properly charged with the control of tuberculosis become aware of its existence in a herd to which a policy of slaughter and compensation cannot reasonably be applied, such herd must be dealt with by the owner, under Government supervision, on the principle of the separation of all sound animals from those affected. Such separation must be effected by treating the whole herd as diseased, and rearing the calves separately, either on pasteurized milk or the milk of healthy cows, or, when the number of those affected is so small as to warrant such a course, by the application to the whole herd, from time to time, under official supervision, of the tuberculin test, and the entire segregation of all animals found to react. In the event of any owner refusing or neglecting to adopt either of the above methods, his entire herd to be closely quarantined and sales therefrom to be entirely prohibited.

(3) That a policy of compensation be recommended as useful and usually necessary as a temporary measure.

(4) That when slaughter is necessary, in order to avoid economic loss, every effort should be made to utilize as far as possible the meat of such animals as may be found fit for food on being slaughtered under competent inspection.

(5) The details of the commission plan will be found fully set forth in the appendix to this report.

Resolution 7.—Prevention.—(1) That with the object of preventing the spread of infection persons buying cattle for breeding purposes or milk production should, except when such purchases are made from disease-free herds which have been tested by a properly qualified person, purchase only subject to the tuberculin test. In order to assist in the proper carrying out of this suggestion, the commission recommends that official authorities

should adopt such regulations as will prevent the entry to their respective territories of cattle for breeding purposes or milk production unless accompanied by satisfactory tuberculin test charts.

(2) That all milk and milk by-products used as food should be properly pasteurized unless from cows known to be free from tuberculosis.

Resolution 8.—*Control of Tuberculin Test.*—That this commission recommends the passage of legislation which will prevent the sale, distribution, or use of tuberculin by any person other than those acting with the full knowledge or under the direction of official authorities.

Resolution 9.—*Education.*—As a clear knowledge of the cause and character of tuberculosis among animals, the modes of dissemination, and its significance as an economic and as a public-health problem underlie an intelligent adherence to the principles that must be observed in all efforts for eradication, as well as the establishment of proper co-operation in the great work between physicians, veterinarians, live-stock owners, legislators, and the public generally, it is recommended that a widespread campaign of education be undertaken. To accomplish this end it is recommended that, first of all, a simple pamphlet on bovine tuberculosis be written, in which the language used shall be of such character that every person of average intelligence shall be able to read it without being mystified by technical terms or phrases. This pamphlet should be published with the indorsement of the American Veterinary Medical Association and the special indorsement and consequent authority of the International Commission on Bovine Tuberculosis Control.

Resolution 10.—*Publicity.*—In concluding its work, the commission desires to appeal especially to the press—metropolitan, agricultural, and local—to join in the work of extending as much as possible among the people the conclusions here arrived at. The vital importance of the life of farm animals to the welfare of all classes of society needs no argument in its support. The aim and sole purpose which has actuated this commission has been to arrive at the soundest conclusions possible in the light of the best knowledge obtainable.

Resolution 11.—*Legislation.*—It is recommended that legislation regarding the control and eradication of tuberculosis among domestic animals be made uniform; that the laws of the United States and Canada and other American countries for the admission into America of animals from without be made stringent and as much alike as possible; and that the laws governing the interstate and interprovincial movement of cattle and that between different American countries be harmonized.

The laws governing interstate and interprovincial movement of cattle should be of such character that every State and every province will be free in its eradication work from unnecessary difficulties due to the existence of the disease in other States and provinces.

Legislation is especially required to prevent the various frauds which interfere with the satisfactory use of tuberculin as a

diagnostic agent for tuberculosis, as well as for official supervision over all tuberculin sold to be used by veterinarians and others.

Resolution 12.—*Sanitation.*—In the eradication of tuberculosis it should be kept in mind that, in addition to protecting animals against exposure to tubercle bacilli, it is desirable to make them as resistant to infection as possible. This can be done by stabling them in clean, disinfected, and properly ventilated and lighted barns, giving them abundant clean water and nutritious food, a sufficient amount of daily exercise in the open air, and attending generally to those conditions which are well known to contribute to the health of animals.

The daily removal of manure from stables, and water-tight floors and good drainage in stables are urgently recommended.

Young stock, particularly, should be raised as hardy as possible and should be accustomed to liberal exercise and living in the open.

Resolution 13.—*Immunization.*—That as none of the various methods for the immunization of animals against tuberculosis have passed sufficiently beyond the experimental stage, the commission is unable to indorse any of these for practical use at the present time.

Resolution 14.—*Animal Tuberculosis and Public Health.*—While the members recognize that the subject with which this commission is primarily intended to deal is the control and eradication of tuberculosis among animals as an economic problem, they cannot feel satisfied without declaring their recognition of the fact that tuberculosis among animals is also an important public-health problem. Considered as such, the eradication of tuberculosis among animals should have the approval and support of all those persons who are interested in curtailing human suffering and prolonging human life.

Resolution 15.—*General Statement.*—The members of the commission wish it to be clearly understood that they recognize the limitations of a report necessarily based on actual and not on theoretical conditions. They fully realize that in the event of the policy of which their recommendations form the framework being anywhere adopted even in its entirety, much greater benefit will be derived, at least for some time, from its educative than from its executive features. The control, to say nothing of the eradication, of bovine tuberculosis, is impossible of achievement without the hearty co-operation of all the men who are actually engaged in the cattle industry. In order to secure this co-operation, it will doubtless be necessary in most communities to carry on an active and prolonged educational campaign.

It is apparent that in the dissemination of practical and reliable information regarding the disease it will be possible to employ a very large variety of methods. Many of these methods, such as bulletins, lectures, and actual demonstrations of disease, having already been found valuable, will doubtless continue to be largely used. It must not be forgotten, however, that in this, as in any other educative process, a measure of disciplinary control is

essential to success. Needless to say, such control can be secured only by the passage of legislation which, while clear and comprehensive, must at the same time be sufficiently conservative to avoid exciting alarm or arousing antagonism on the part of owners, especially of valuable herds. The best law ever framed can be made an utter failure by stupid or injurious administration, while, on the other hand, the most drastic legislation can be rendered acceptable if enforced with reasonable tact and diplomacy. Provided, therefore, that these qualities, combined with integrity, thoroughness, and determination, are available for administrative purposes, the members of the commission are convinced that the enforcement of a law based on their recommendations will prove to be by far the most powerful and effective educational agency which could possibly be employed.

In concluding its report the commission would suggest that the association should make such provision as may be necessary to carry on the work either by continuing the commission as at present constituted or with such changes in the *personnel* as may be considered desirable.

Report of Committee on Dissemination of Bovine Tuberculosis.

The sub-committee on the dissemination of bovine tuberculosis respectfully submits the appended report on the means for the dissemination of this disease, based on the present knowledge of the life-history of the tubercle bacilli. The possible means for the dissemination of this disease are enumerated as follows:—

(1) The introduction into a sound herd of an animal or animals infected with tuberculosis of (*a*) those with open tuberculosis, (*b*) those in which the disease is in a period of incubation, and (*c*) those in which the lesions are temporarily arrested.

The last group will not transmit the infection speedily, and possibly may never do so. The first group is certain to spread the virus.

(2) By feeding calves milk, whole or separated, buttermilk, or whey, where the milk has come from tuberculous cows.

(3) By bringing cattle suffering from open tuberculosis into contact with healthy ones at fairs, cattle shows, and other exhibitions.

(4) By shipping healthy cattle in cars not thoroughly disinfected, recently occupied by tuberculous cattle.

(5) By placing healthy cattle in stables that have not been thoroughly disinfected and which were recently occupied by tuberculous animals, as frequently happens with the change of farm ownership or tenants.

(6) Tuberculous animals which do not react to tuberculin, such as those in the period of incubation or latent cases, but which develop active tuberculosis later, are frequently carriers of the virus, although bought and sold as sound animals. These cannot at present be differentiated from sound animals. Therefore all cattle coming from herds in which the disease exists should be

considered as suspicious. The sound herd is the unit to deal with.

(7) Tubercle bacilli may be transmitted by tuberculous cattle running in a pasture to healthy cattle in adjoining pastures where they are separated by a fence of such nature that the cattle may get their noses together.

(8) Tuberculosis in cattle rarely, if ever, occurs through infection from (*a*) man, either directly or as a carrier of bovine tubercle bacilli, (*b*) from other species of animals, or (*c*) by infection from the droppings of cows, buzzards, or other birds or carnivorous animals that have fed upon the carcases of tuberculous cattle.

It is the opinion of this committee that bovine tuberculosis is spread largely through the introduction of tuberculous cattle into sound herds, by the feeding of calves with infected milk or milk products, by exposing sound animals to infected one at fairs or other cattle shows, and by exposing them to infected cars and stables. There are other ways in which now and then it is possible that an animal may become infected, but the means of dissemination mentioned in this paragraph are those to be guarded against in formulating efficient methods of control.

V. A. Moore (Chairman), E. C. Schroeder, M. P. Ravenel.

Report of Committee on Disposition of Tuberculous Animals.

Your committee on the disposition of tuberculous animals begs to submit the following report:—

In the work of control and eradication of tuberculosis in animals it is, first of all, of the utmost importance to establish the presence of the disease in all the affected cattle, since only by such a procedure will it be possible to guard the healthy and newly-born animals from infection.

Fortunately we are in a position to determine with considerable certainty the vast majority of occult cases of tuberculosis in cattle, even the incipient cases, with the aid of tuberculin, and the clinical cases by physical examination. This alone constitutes a great advantage in the work of suppression of the disease. The tuberculin test should therefore be considered as a very important step in the eradication of tuberculosis. As a matter of fact, all the recognized authorities on the subject are agreed on this point.

Once the tuberculous animals are recognized, consideration must be given to the most suitable and economical way of eradicating the disease from the herd. This naturally brings up the question of the disposition of the tuberculous animals, and in adopting any particular method one should be guided by the extent of the infection of the herd, the quality of the affected animals, the sanitary condition of the premises, and, last but not least, the owner's intelligence and knowledge of the subject. The latter information is necessary to determine if reliance can be placed on the owner to carry out minutely all the details

which are essential in executing any particular method of eradication that may be decided upon.

The owner's co-operation in this work is without doubt a very essential feature of this great task. For this reason a campaign of education of the farmers and stock raisers relative to the control of tuberculosis, in which all the advantages of the eradication of tuberculosis must be impressed on them, would greatly facilitate this important campaign. It is a well-known fact that any voluntary method of suppression by the herd owners themselves would bring about better and quicker results than when compulsory measures are enforced upon them by legislative enactments. Nevertheless, the time has arrived when a campaign looking toward the control of this disease should be entered upon by the general Government, as well as the State and the Province. This campaign must reach in the first place all the clinical pulmonary forms of tuberculosis; then tuberculosis of the udder, intestines, and uterus.

Having removed these exceedingly dangerous cases, the balance of the tuberculous herd may be treated by the Bang system, which consists in the establishment of two herds of cattle, one containing the animals which reacted to tuberculin and the other those that proved to be healthy. Each class of cattle is kept entirely separate from the other, in different stables when possible, and under the care of separate attendants, using separate utensils. The calves born of diseased cows are removed from their mothers at birth and placed in the stable with the healthy animals, where they are reared upon the milk of healthy cows or upon other milk which has been properly pasteurized. In this way the healthy portion of the herd constantly increases, while the diseased animals are disposed of as rapidly as may be deemed necessary, until finally all of them are gone and the remaining herd is composed entirely of healthy cattle. The tuberculin test is applied to the healthy herd at regular intervals, annually or semi-annually, in order to detect any cases of latent tuberculosis or recent infection which may appear.

A modification of the Bang system is Ostertag's method of suppressing tuberculosis. This system demands only a clinical examination of the original herd, with the elimination of all open cases of tuberculosis. The calves from the remaining cows are immediately removed and brought up on pasteurized milk in the same manner as in the Bang system, and a new herd is thus established from the young stock. Healthy nurse cows could be used for these calves instead of feeding them on pasteurized milk. The tuberculin test is applied to this new herd at stated intervals in order that any cases of tuberculosis which may develop therein may be discovered promptly.

Neither of these systems, however, has met with much favour in this country, as it requires a considerable length of time and care to create a herd free from tuberculosis by either of them. Nevertheless the inauguration of Bang's or Ostertag's method in herds of valuable animals, whether they be dairy or beef breeds, is unquestionably of an economic value, and in such cases either of these systems should be encouraged. On

the other hand, in ordinary beef or dairy herds the practice of Bang's or Ostertag's method in this country has not met with much encouragement, owing to the extraordinary supervision, time, and labour, as well as the loss of market milk from the reacting cows, which it involves.

In such herds the best ultimate results have thus far been obtained by the obligatory disposal of all the clinically affected cows, and giving the dairyman the alternative either to pasteurize the milk from the remainder of his herd or to be forced to refrain from selling the raw milk from the infected herd at all. In case he adopts the former method, the herd composed of diseased and healthy cattle should be placed in quarantine under the supervision of sanitary authorities, and no sales should be permitted from the herd excepting for immediate slaughter. The alternative method will compel him to dispose of his tuberculous animals in case he refuses to pasteurize the milk.

The suppression of tuberculosis could be greatly facilitated and the co-operation of many of the herd owners could be gained by a provision by which a certain percentage of indemnity could, at least for a term of years, be paid for the condemned animals. The scale for such an indemnity should be arranged in accordance with the final disposition of the carcase under competent inspection.

Another method of eradication should receive serious consideration as being of value in some localities. This is known as the Manchester system, which is either the Ostertag or Bang system applied to localized areas or even individual farms, from which centres the work progresses to surrounding or neighbouring districts and farms.

Inasmuch as the animals affected with clinical tuberculosis are the greatest sources of danger in the dissemination of the disease, compulsory reporting of such cases should be inaugurated by the State, as is now done in many places in the control of human tuberculosis. Mandatory reporting of these cases and their prompt slaughter are very essential, as only by the elimination of these exceptionally dangerous cases can it be hoped to take up all the other details by which a successful control of bovine tuberculosis may be accomplished.

In conclusion your Committee, having regard to the disposition of pure bred cattle, or valuable animals kept for either breeding or dairy purposes, would strongly recommend a system requiring the removal of all clinically tuberculous animals from the herd, the segregation of all calves from the remaining cows in order to establish a new clean herd, the use of tuberculin-tested nurse cows or pasteurized milk for these calves, and the periodic application of tuberculin to this newly-established herd, as the only thoroughly reliable one.—W. C. EDWARDS, *Chairman*; JOHN R. MOHLER, FREDERICK TORRANCE.

THE COMMISSION'S RECOMMENDATIONS ON ERADICATION—A COMPOSITE OF THE METHODS OF BANG AND OTHERS.

The commission, after stating the known facts regarding the nature of tuberculosis and enumerating the principles to be

observed in its prevention and eradication, recommends the following plan of procedure. It is recognized that in several points there are opportunities, in order to meet individual needs, to change or modify the directions herein given. It is understood, however, that whenever such modifications are made they should conform in the greatest detail to the principles laid down in the report of this commission. The plan has for its purpose the conservation of the herd whenever that is possible.

The control of bovine tuberculosis involves a definite procedure under two distinct and different conditions, namely, (1) where a herd of cattle is free from tuberculosis and it is to be kept so, and (2) where one or more animals in the herd are infected and the purpose is to eradicate the disease and establish a sound herd.

Procedure Under First Condition.

The prevention of tubercular infection in cattle free from tuberculosis consists simply in keeping tuberculous cattle or other animals away from the sound ones—in keeping tuberculous animals out of pastures, sheds, or stables where the sound ones may be kept. Healthy cattle should not be exposed to possible infection at public sales or exhibitions. Raw milk or milk by-products from tuberculous cows should not be fed to calves, pigs, or other animals. Cars that have not been thoroughly disinfected should not be used for the transportation of sound cattle. Cattle that are purchased to go into sound herds should be bought from healthy or sound herds only.

Procedure Under Second Condition.

The eradication of tuberculosis from infected herds requires for conservation of the herd different procedures according to the extent of the infection. For a guide to the control of the disease, tuberculous herds may be divided into three groups, namely:—

(i.) Where 50 per cent. or more of the animals are infected.

(ii.) Where a small percentage (15 per cent. or less) of the animals are affected.

(iii.) Where a larger number (15 to 50 per cent.) of the animals are diseased.

In eliminating tuberculosis from infected herds the following procedure is recommended:—

Group I.—Herds where a tuberculin test shows 50 per cent. or more of the animals to be infected should be treated as entirely tuberculous. The procedure here is as follows:—

(1) Eliminate by slaughter all animals giving evidence of the disease on physical examination.

(2) Build up an entirely new herd from the offspring. The calves should be separated from their dams immediately after birth and raised on pasteurized milk or on that of healthy nurse cows. This new herd must be kept separate from any reacting animals.

(3) The young animals should be tested with tuberculin at about six months old, and when reactors are found at the first or any subsequent test the others should be retested not more than six months later. When there are no more reactors at the six months' test annual tests should thereafter be made. All reacting animals should at once be separated from the new herd, and the stables which they have occupied thoroughly disinfected.

(4) When the newly-developed sound herd has become of sufficient size the tuberculous herd can be eliminated by slaughter, under inspection, for beef.

Group II.—(1) The reacting animals should be separated from the non-reacting ones and kept constantly apart from them at pasture, in yard, and in stable. (*a*) *Pasture.*—The reactors should be kept in a separate pasture. This pasture should be some distance from the other, or so fenced that it will be impossible for the infected and non-infected animals to get their heads together. (*b*) *Water.*—When possible to provide otherwise, reacting cattle should not be watered at running streams which afterwards flow directly through fields occupied by sound cattle. The water from drinking troughs used by infected animals should not be allowed to flow into stables, fields, or yards occupied by sound animals. (*c*) *Stable.*—Reacting cattle should be kept in barns or stables entirely separate from the ones occupied by the sound animals.

(2) Calves of the reacting cows should be removed from their dams immediately after birth. Milk fed these calves must be from healthy cows, otherwise it must be properly pasteurized. These calves should not come in contact in any way with the reacting animals.

(3) The non-reacting animals should be tested with tuberculin in six months, and when reactors are found at the first six months, or any subsequent test, the others should be retested not more than six months later. When there are no more reactors at the six months' test, annual tests should thereafter be made. All reacting animals should at once be separated from the new herd and the stables which they have occupied thoroughly disinfected.

(4) The milk of the reacting animals may be pasteurized and used.

(5) Any reacting animals which develop clinical symptoms of tuberculosis should be promptly slaughtered.

(6) An animal that has once reacted to tuberculin should under no circumstances be placed in the sound herd.

(7) As soon as the sound herd has become well established infected animals should be slaughtered under proper inspection.

Group III.—Herds that come within this group should be dealt with either as in Group II, where the herd is separated, or as in Group I, where all of the animals are considered as suspicious, and an entirely new herd developed from the offspring.

General Precautions.

In *all* cases animals that show clinical evidence of the disease should be promptly eliminated. They should be destroyed if the disease is evidently far advanced; if not, they may be slaughtered for food under proper inspection.

All milk from tuberculous cows that is used for food purposes should be thoroughly pasteurized. This means that it must be heated sufficiently to kill or to render harmless any tubercle bacilli that may be present in it. For this it is necessary to heat the milk for twenty minutes at 149° F., or for five minutes at 176° F. It is important that pails or other utensils used in carrying the unpasteurized milk should not be used, unless previously sterilized, for storing the milk after it is pasteurized.

When diseased animals are found, the stables from which they are taken should be thoroughly cleansed and disinfected. To accomplish this all litter should be removed; floors, walls, and ceilings carefully swept, and the floors, together with mangers and gutters, thoroughly scrubbed with soap and water. Thorough cleaning before the application of the disinfectant can not be too strongly emphasized. After cleansing, the disinfectant should be applied. A 5 per cent. solution of carbolic acid, a 1 to 1,000 solution of corrosive sublimate, or a 4 per cent. solution of sulphuric acid may be used. When the stable can be tightly closed, formaldehyde gas, properly used, is reliable and satisfactory.

If tuberculous cattle have been kept in a small yard, the litter should be removed, the surface ploughed, and the fencing and other fixtures thoroughly cleansed and disinfected.

GOVERNMENT BUREAU OF MICROBIOLOGY, NEW SOUTH WALES (FIRST REPORT).

This Bureau, which holds the status of a Government Department, has, through its director, issued a valuable and comprehensive first report. The functions of the Bureau apparently embrace a wider field than its title would lead one to infer, for in addition to microbiological work, embracing both plants and animals, for the various State departments, especially those of public health and agriculture, a very considerable number of pathological examinations are conducted during the year. Naturally the bulk of the work of interest to the pathologist deals with the human subject, but many sections are devoted to observations on animal diseases prevalent in New South Wales. In this connection, although strictly correct, it seems rather unfortunate, especially in the absence of a detailed index, that under the sub-heading "Diseases of Animals," those diseases special to the human subject should be mixed up with those special to the lower animals. As an instance, we find a section on gonorrhœa sandwiched between those on tetanus in lambs and swine fever.

Under "Dysentery and Diarrhœa," which commences with the human phase in two short paragraphs, we find a lengthy article on "Diarrhœa in Calves," in which the fact is emphasized that all cases of "scour" in young and newly-born calves are not due to pasteurella invasion, but many probably to fermentative changes; and further, that the administration of pure lactic-acid bacteria in the food, following Metchnikoff's theory, seemed to prove of great value in the treatment of such cases. The cases of tetanus in lambs followed docking by means of the searing iron. In common with others who have noted a liability for tetanus to follow this method of operation, it is concluded that the system favoured the inclusion and development of the tetanus bacillus.

Pseudo-tuberculosis (Lymphadenitis) in sheep has received attention, and it is found the glands of the inguino-femoral and axillary regions are most affected. In this respect, and in the histological details, the observations agree with those of others in regard to this disease. Cocci and a bacillus have been isolated from these caseous glands, but although the bacillus on inoculation into experimental sheep produces similar pathological changes to those found in the naturally affected animal, yet "observations made . . . . have not identified it with the *Bacillus pseudo-tuberculosis ovis*, Preisz," which seems unexpected in view of the detailed report by Cherry and Bull in Victoria, and also that by Gilruth in New Zealand of the same disease, which they identified as being identical to that in Europe and America, and due to the same bacillus described by Preisz, Nocard, Norgaard, and others. Swine fever is simply noted as having been suspected in specimens received for examination. Bovine mammitis at an agricultural college is recorded, and from some cases a streptococcus was isolated. A vaccine was prepared and "injected in the usual way into eight mammitis cows, four other cows untreated being kept under observation as controls." The vaccination, as to the details of which no information is given, was "without beneficial results," consequently the Director states he is "not prepared to pass judgment on the prospects of vaccine therapy in this condition," for he suggests a non-pathogenic streptococcus may have been used. More detailed information as to the procedure would have, however, been interesting. "Endemic Hæmaturia (South Coast Redwater) in Cattle" receives much attention. Dr. Burton Cleland, Principal Assistant Microbiologist, especially has made a number of observations on the condition, which has been recorded in the Mount Gambier district of South Australia, as well as the South Coast of New South Wales. The affected animals are anæmic, and blood escapes along with the urine. The chief lesion noticed *post mortem* is that of multiple angiomatous papillomata of the bladder, which serve to account for the presence of blood in the urine. The cause has been popularly ascribed to different plants, but experiments with these proved negative. Protozoa and also bacteria are considered improbable as causative agents of the bladder lesions, and it is suggested that the cause of the condition

may be similar to the hitherto undetermined cause of angiomata of the liver (usually considered congenital), so frequently met with in cattle, sheep, and even man. A footnote to this section mentions the presence of pentastomes in the mesenteric glands of such Redwater cattle, but it is admitted "the relationship is not apparent at present," and it may be added here that to those who have studied pentastomes any relationship would be surprising.

Jaundice in lambs and balanitis in sheep also receive notice, but no light is thrown on the incidence or cause of such conditions.

On the whole, so far as diseases treated are concerned, the report chiefly deals with historical or other data, interesting and necessarily requiring record, but unless with certain experiments on feeding with plants suspected of being disease-producing, and which proved negative, the record of experimental work and even of original observation is meagre. Nevertheless, the report is a valuable document to those engaged in the study of animal diseases in Australia, and serves to co-ordinate and crystallize the information available regarding their incidence, with the addition of further observations of cases which have come under the officers' own immediate review. We look, therefore, to good experimental and research work following this report. We would only suggest that the Bureau could, with benefit, add to its able staff a skilled veterinary pathologist, who could bear in mind points regarding hygiene, feeding, and general management of stock that may be overlooked by those with a purely scientific training, not combined with practical experience of conditions likely to deleteriously affect the domesticated animal.

As is to be expected from a Department so closely concerned with the public health, milk receives great attention and many pages are devoted to its bacteriology, and a section of this records an exhaustive investigation into the effects of commercial pasteurization of milk as carried on in Sydney. This is so instructive and so valuable to all those interested in a pure milk supply, and affords such conclusive proof that safety in relation to this product as a food, especially for infants, is to be looked for more from proper inspection and control of dairies, &c., rather than from such methods as what may be termed by vendors "pasteurization," that we propose to publish almost *in extenso* this section of the report. Meanwhile some of the conclusions of the Director, Dr. Tidswell, for example, that "pasteurization is not a hygienic but purely a commercial process," and further, that "it confers no particular benefit to the consumer, but rather the reverse," are worthy of especial emphasis.

The parasitological work of the Bureau has been of a most varied description and includes the various fungoid forms of parasites infecting fruits, cereals, vegetables, &c., especially the potato, wheat and maize, besides a disease of the banana plant, which affords a good example of secondary invasion of diseased tissues by saprophytes. Protozoan parasites—spirochætes, trypanosomes, sarcosporidia, and particularly sporozoan hæma-

tozoa—are recorded from a number of animals (mammals, birds, and reptiles). But metazoan parasites of Australia have received a larger share of attention. In addition to useful lists of parasites already recorded from man, domesticated animals, monotremata, and marsupials in the Commonwealth, descriptions in fuller detail of several new species of cestodes (from the laughing jackass, jabira, sparrow, and a lizard), and a new nematode (from cattle) are included, although naturally much of this has already appeared as original articles in scientific journals by the officers of the Bureau.

From the veterinary point of view the nematode *Onchocerca gibsoni* is the parasite of most interest on account of the action of the British authorities in condemning portions of Australian frozen meat because of the presence therein of fibrous nodules containing this worm. In addition to a more detailed description of the parasite by Messrs. Cleland and Johnstone than is contained in their former publications, they add an excellent critical account of the history of these "worm nodules" as experienced in Australia and enter into a discussion of their occurrence, their structure, and the effects of the parasite, comparing also its specific location with that of *Onchocerca fasciata* of the camel. After traversing the various possible means of transmission, and deciding on the necessity for an intermediate host, the question of whether that is likely to be a dipteroid fly or a fresh-water crustacean is still left open, but it is to be noted the original host of the parasite is regarded as being either imported cattle from India or buffalo from Timor.

Concerning the work as a whole in parasitology, the workers must be complimented. Almost every class of parasite, plant, and animal are touched upon more or less. The bulk of the work, other than routine work, is systematic rather than economic and experimental in character. Valuable as records of existing species undoubtedly are, especially in a young country—and the important subject of parasitology is only in its earliest infancy in Australia to-day—still one hopes confidently that such a relatively rich institution as the N.S.W. Bureau of Microbiology, as well as academic research, will accomplish work of an experimental nature, which although not to be judged primarily by its positive and economic results, yet demands money, time, and such wealth of professional and non-professional assistance as that with which this Bureau is so well endowed. This is almost assured by the report under review, which contains so much that is good, and the Director, Mr. Tidswell, is certainly to be highly congratulated on the ability and hard work of the staff which has co-operated with him in the preparation of such a valuable publication.

Miscellaneous.

FREE VETERINARY TREATMENT.—The following veterinary surgeons have kindly undertaken the free treatment of poor people's animals needing attention, under the auspices of the North Staffordshire Branch of the Royal Society for the Prevention of Cruelty to Animals: Burslem, Mr. J. T. Allen; Longton, Mr. Tart; Newcastle, Mr. R. C. Trigger; Stoke, Mr. W Coe; Tunstall, Mr. George Smith.

UNIVERSITY OF LONDON.

THE following have been appointed examiners for the Intermediate and Final Examinations in the Faculty of Science (including Veterinary Science for Internal Students for 1911), those marked with an asterisk being appointed Chairmen of their respective boards:—

Veterinary Anatomy.—E. S. Shave (Royal Veterinary College), together with the External Examiner.

Veterinary Physiology.—The External Examiners (*Professor G. A. Buckmaster as Chairman).

Zoology.—Professor H. W. M. Tims (Royal Veterinary College).

Veterinary Hygiene.—*G. H. Wooldridge (Royal Veterinary College), together with the External Examiner.

Veterinary Pathology.—The External Examiners (*Professor Sir John McFadyean as Chairman).

Reviews.

IL PORCO—THE PIG. By Professor F. Faelli. Published by Ulrico Hoepli, Milan.

This is one of the Hoepli manuals destined to educate Italian agriculturists in the primary principles of good breeding and feeding of animals and giving interesting facts on the industrial side of the matter. The work under review deals with the pig, discussing the race, rearing, and industry, in 461 pages, divided into twelve chapters. Italian pigs cannot be said to hold premier positions in the porcine world and native breeders do not appear to have given much consideration to their improvement. The Sasertana race is one with good prospects, which has been improved by selection and crossing with the Yorkshire. The Roman pig is rustic and long legged, and the Modinese is also of a semi-domesticated cut, but books such as the manual under review will open the eyes of the Italian breeder to the possibilities of his swine. The chapter on special hygiene, comprising 144 pages, is comprehensive and fully written, and although we have not gone so far as to peptonize food for swine in this country, yet on page 284 we can learn about the process.

Industrial residues, green fodder, roots, cakes (apparently largely used in Italy), among which we notice olive-cake, all come under review and the chapter concludes with some food tables by Wolf and Kellner, which we hope the pig breeder will be intelligent enough to digest and apply.

As a pioneer work on the subject of the pig from the Italian standpoint, the book will probably accomplish part of its aim; at any rate, we hope so, for with the conditions existing in Italy and the material present, there is much leeway to be made up. It is gratifying to see that prominent men are taking an interest in the betterment of animal production and the science of eugenics all the world over and proof that the Italians are not lagging behind in the general movement of advance is furnished by this book. The volume is only one of a similar kind to those which have already been produced in England, France, and Germany by native authors. The illustrations in the book leave something to be desired. The Englishman will not think much of the representation of the small Yorkshire on page 67, and it is time that the synonyms of New Leicester and Middlesex were discarded in reference to this breed. The picture of the large Yorkshire on page 58 is by no means a good one and a Frenchman would not think that the Craounais pig on page 102 had had sufficient to eat. The illustrations of styes and troughs are perhaps the best in the book.

We observe no reference to the advantages of grazing for pigs, perhaps because, as we have indicated, they are so present that familiarity has rendered them obscure.

As the breeds of Italy improve and become perchance more be-styed, the point will come home to the breeders; but in a country with so much sun, the Italian pig is not likely to suffer from too prolonged or close confinement.

G. M.

Translations.

TRAUMATIC ARTHRITIS OF THE HOCK, TREATED BY BIER'S METHOD.—CURE.

BY MESSIEURS DARBOT AND AUGUSTIN,

Veterinary Surgeons to the 4th Hussars.

A FIVE-YEAR-OLD horse, Tison, entered the infirmary on October 12, suffering from a kick on the internal face of the left hock. At this moment there was only a penetrating fistulous wound; no discharge of synovia; the articulation was not affected. Very acute pain was shown when the horse put weight on the limb, and on the other hand the situation and direction of the fistula caused us to fear arthritis as a possible complication. The patient was placed in slings and repeated vesicating frictions made to the hock. Under the influence of this treatment the

fistula slowly cicatrized. The subject could walk a few yards; weight being placed on the foot, but flexion of the hock was very painful and the internal surface of the region was the seat of a very hot swelling, very sensible to pressure. Improvement was not of long duration. The following days swelling increased and lancinating pains appeared. Finally, on November 25, we punctured an abscess which gave discharge to some synovial pus, leaving us no doubt as to the gravity of the complication. The horse was slung again and we tried successively different treatments: injections of silver nitrate, boric acid in concentrated solutions, &c., without success; the same discharge persisted, no weight was borne on the foot, the subject became emaciated, the posterior left limb atrophied, and we feared laminitis in the other foot. Finally, as a last resort, we resolved to try Bier's treatment.

We used Esmarck's bandage, which all regimental veterinary infirmaries possess; we applied it each time with a tension moderate enough to allow introduction of the finger under the indiarubber bandage. The place of application was a few centimetres above the hock joint, and in order to avoid cutaneous excoriation, we put the bandage on over a fine layer of wadding.

On December 14 the bandage was applied from 10.30 to 1 o'clock, and from 3.30 to 7 o'clock. The horse got very excited and anxious at the first application and lifted both his hind feet, being at times in a position of unstable equilibrium; his body was covered with sweat, but gradually he calmed down and the period of excitation, which lasted about fifteen minutes, was followed by a period of complete rest. Lancinating pains became less frequent, and appetite returned.

December 15.—To avoid accidents the horse was suspended before putting on the bandage. This was put on at 8.30 in the morning and taken off at 3.30 in the afternoon. Period of excitation shorter. As at first, we obtained a localized œdema of the hock; the lower part of the leg was not œdematous. The orifice of the fistula gave discharge to an abundant sero-sanguineous liquid; little pus.

December 16.—Application of bandage from 8.30 to 4.30: great improvement; lancinations less frequent; limb resting lightly on toe; less discharge.

December 17.—Application of the bandage from 9 o'clock in the morning to 4.30 at night. The fistula was very narrow and a serous, limpid liquid flowed away in drops.

December 18.—Application of the bandage from 9 to 5; discharge ceased; fistula completely cicatrized; horse suffers much less; fewer lancinations. On this day the temperature, when the exudate could no longer escape, went up a degree, although on previous days it had only varied one-fifth to two-fifths of a degree.

On the 19th we ceased all treatment; the state of the invalid improving daily.

To-day, January 15, the swelling of the hock has much diminished, and the gait is good. Appetite is normal and the

horse is putting on flesh. It is doubtful if he will be used again in the service, but with firing and a long rest he would make a good carriage horse.

This record is interesting, because five applications of Bier's treatment cured a traumatic tarsal arthritis when other reputed treatments applied with care gave no results.

(*Recueil de Médecine Vétérinaire.*)

REMOVAL OF THE OS PEDIS AND RECOVERY.

By Chief Veterinary Surgeon PAUL SCHMIDT.
Békéscsaba, Hungary.

Four years ago last October, I was called to the domain of Count Géza Wenckheim in Csorvas in order to see his Noric stallion which had been suffering from foot lameness for six weeks and which two graduates had been attending unsuccessfully.

On examination I found that the stallion was excessively lame on the near hind foot, the coronet was much swollen, and at the outside there was a round opening the size of a crown, from which, on pressure on the sole, a great quantity of greyish pus and necrotic débris made its appearance.

At first sight I thought that a quittor was present and had the stallion cast, the horn removed, and the fistula laid open, so that I could look into the foot. The internal parts of the foot had sloughed away, the pedal bone was quite discoloured and black, the joint capsule was destroyed, the extensor and flexor tendons loosened so that the coffin bone was only attached to the lateral ligaments.

As the stallion was a great favourite and the cost of treatment of no account, I undertook an experimental operation. I made a correspondingly large opening at the sole, separated the pedal bone from the lateral ligaments, and took it out. There was a piece of bone missing on the outer side of the os pedis, which had been broken by a nail in shoeing. The shoeing-smith denied this when proof of the injury was shown to him immediately after the operation, but imagined that an old stump of a nail was in the foot and that a new-driven one bent at the point and so penetrated to the bone. A piece had become detached from the bone and so caused the profuse discharge at the coronet.

Treatment.—The hoof was syringed out with five per cent. creolin solution, strewn with iodoform powder, and packed with carbolic wadding and bandaged with linen dipped in creolin solution. The treatment was repeated twice daily at first, the foot being placed in a bucket filled with lukewarm 3 per cent. creolin solution for half an hour and afterwards bandaged with iodoform powder and carbonized wadding. The flat foot has grown together somewhat. The wound

at the coronet healed and the sole became covered up, so that the stallion was cured in three months, and in the early spring could cover mares again and be used to cart fodder. On tapping the hoof a hollow sound was emitted.

After covering mares for four years the stallion was sold for 900 crowns to a miller at Oroszhaza, where he is still employed to cart meal and cover mares.

I have delayed publication of this case for so long in order to observe the horse and have until now waited in vain for the foot.

The collegians who do not believe this can confer with the estate manager as to whether it was so. I say this because some graduates to whom I have spoken about the case would not believe me. I have therefore freely given the name of the present owner to whom they may apply.

(*Osterreichische Wochenschrift für Tierheilkunde.*)

A CASE OF ŒSOPHAGISMUS.

By VON HOLWEDE.
Veterinary Surgeon.

The light draught horse, No. 7, "Harry," of the divisional team of the Westphalian Foot Artillery Regiment, suddenly fell ill at 8 o'clock in the morning of March 23, 1910.

After he had eaten up his food at 5 o'clock with a good appetite he passed, shortly after drinking a large quantity of water at 9° C. temperature, through his mouth and nostrils a thready slime mixed with particles of food.

His head was sunk and held out; then, with a coughing sort of noise, discharge was thrown out in jerks.

In the neighbourhood of the neck vermiform contractile movements were noticeable.

Vomition appeared always at intervals of ten to fifteen minutes on March 23, 1910. By pressure on the œsophagus in the neck region this vomiting could be occasioned. The emptied vomit had a sweet stale smell and a slimy thready consistence. Particles of food were no longer mixed with it. Sour masses were never vomited.

The visible mucous membranes were rosy red. The mucous membrane of the mouth was covered with a tenacious stale smelling slime. Temperature about normal, 37.6° C. Respirations, 14 per minute. The pulse was 44 per minute perceptible, moderately strong, equal and regular. Food and water were completely refused. Intestinal movement was active. Dung was passed in moderate quantities; it was well moulded and devoid of foreign matter. There was no sign of respiratory trouble.

On March 24, 1910, at 12 o'clock mid-day, the attacks only occurred at intervals of thirty minutes, and at 5 o'clock in the

afternoon had ceased. Already at 4 o'clock "Harry" has tried to take hay and straw.

On March 25, 1910, there were no longer any appearances of illness, and since then there has been no return of the trouble.

The treatment was as follows: Quietness, untying the halter, rinsing out the mouth with vinegar and water, washing out the nostrils with lukewarm water. On the 24th a hypodermic injection of morphia.

Only soft food was given (bran and crushed oats) and he was brought on to whole oats, hay, and straw gradually. Cautious watering with lukewarm water was especially advised as the cause of the attack was great indulgence in a draught of cold water.

(*Zeitschrift für Veterinärkunde.*)

TRANSMISSION OF TUMOURS BY COITUS IN THE DOG.

By Dr. A. STICKER.

The author recently recorded a case of experimental transmission of a sarcoma in the dog. The tumour had previously been removed from the penis of a dog. Implantations on the skin, in the abdomen, pleura, testicle, bone, mouth, brain, vagina, eye, all showed the production of invading and metastatic tumours.

This experience, already realized in mice and rats, shows that malignant tumours can be experimentally transmitted. An accidental, spontaneous transmission has not, however, been reported although it appears theoretically possible.

To solve the essential question of knowing whether tumour cells lose their infecting properties in the inflamed and bleeding products of the surface of tumours the following experiment was conducted. From a bitch affected with ulcerous sarcoma of the vagina of experimental origin some liquid obtained by light pressure was obtained by a tapering pipette and injected under the skin of the thorax of two healthy dogs. Two tumours developed which increased to the size of a chestnut. A second series of experiences was realized with a spontaneous vaginal sarcoma in a bitch. Two ulcerated masses were removed and implanted under the skin of two dogs. At the point of implantation two voluminous tumours arose.

In other experiments infection was produced at the level of the vaginal vestibule of the bitch by rubbing a tumour (sarcoma) from the penis of a dog on the mucosa, which had been eroded by friction with sea-sand. A bitch which suffered from two ulcerated sarcomatous nodes as large as filberts at the entrance of the vagina was covered by four dogs. The first copulation took place on May 29. For three months and a half nothing was seen on the penis of the dog; at this time, however, a tumour appeared which reached the size of a mulberry and the glands

of the groin tumefied. The tumour reached the volume of a hen's egg and then reduced itself to that of a chestnut and remained stationary. From the 10th to the 17th of July the bitch was covered by three other dogs. On one of them, on the 106th day after, seven nodules the size of a millet seed were noticed on the superior left face of the penis; in ten days they were the size of hemp seeds. The two other dogs remained unaffected.

These facts show the possibility of transmission of tumours by simple contact. They show the reality of examples of contagion reported in man, notably cases of transmission of uterine cancer to the penis (cancer à deux).

(*Revue Générale de Médecine Vétérinaire.*)

SERPENTINE TONGUE IN CATTLE, WITH SPECIAL CONSIDERATION OF ITS SIGNIFICANCE TO THE BREEDER.

By MEYERSTRASSE.

"Serpentine tongue" in the ox is a vicious habit which consists in varied and rapid movements of the tongue at the interior and exterior of the buccal cavity and around the commissures of the lips. The head and neck are held in complete extension; the animals then produce a deglutition of saliva more or less mixed with air, which is accompanied by a characteristic noise.

This wind-sucking has nothing in common with that of the horse; it is more prevalent among cattle than the corresponding habit in horses. In certain steadings it degenerates into a veritable calamity; 20 per cent. may be seen affected. This vicious habit is quickly contracted; in fifteen days or three weeks the animals have acquired the habit of playing with their tongue and of projecting it out with serpentine movements. But deglutition of air does not take place at first; it is only acquired afterwards and may be considered a complication of serpentine tongue. At length on full-grown subjects this vice causes astonishing lesions. The bad positions which the animals take during deglutition cause deformity of the dorso-lumbar vertebræ, leading to lordosis or cyphosis; the market value is thus largely diminished, without taking into account the concomitant emaciation. What makes things worse is that the habit is irremediable; very rarely does spontaneous cure occur. Manifestations are identical in young animals and adults; there is only a difference in the intensity of the wind-sucking. Diagnosis is always easy; attentive observation discloses the whole performance. This affection may be distinguished from pica by the abnormal movements of the tongue and the position of the head and neck. It may result from *ennui* due to prolonged confinement in the stall; the spirit of imitation and even heredity appear to have a great influence in the matter. Prophylactic measures seem to be indicated. Putting out on the meadow and isolation of wind-suckers are the chief measures. Against the vertebral deformity a martingale and a muzzle may be employed.

(*Deutsche Tierärztliche Wochenschrift.*)

IS THE CARROT TOXIC?

By HOLTERBACH.

Is the carrot toxic? It seems as if it were not possible to solve this simple question. In any case, the following observation merits attention.

A farmer outside Offenburg possesses a middle-aged cart-mare, employed on the land. One morning the mare was found lying on her side and unable to rise. Temperature 38.7°; pulse full and regular; respiration normal; appetite feeble; excrement and urine normal. There is no tumefaction nor contraction of the muscles of the croup; sensibility quite apparent; she appears nevertheless to be weak on her hind legs. She is unable to rise, although making every effort to do so. One concludes that there is paralysis of the posterior members affecting the flexors and extensors from the stifle to the foot.

What is the origin of this trouble? The history obtained showed that the mare received hay and carrots for three months and that during the day she had had a basketful of these, holding about 60 lb. The animal received for three months this colossal quantity of 60 lb. of carrots a day.

The probable diagnosis was poisoning by carrots, and hydrobromate of arecolin was prescribed.

After some days the mare got up and regained her appetite. For two days she exhibited muscular tremors, but cure was complete.

This observation recalls two other similar cases whose origin was mysterious, observed in 1888 and 1889. In both cases the same symptoms were present: paralysis of the posterior members and diminution of sensibility towards the extremities. In these cases the animals had been fed with carrots.

(*Revue Générale de Médecine Vétérinaire.*)

FEEDING OF HORSES WITH CARROTS.

By R. FRÖHNER.

In 1907, Holterbach declared that the carrot (*Dancus carota*) contained a poisonous principle, carotine. He stated that according to the popular idea the carrot possessed vermifuge properties and announced that prolonged feeding can cause the death of white mice and provoke a certain paralysis in the horse.

The same observations are confirmed by those of Thomassen, and on the other hand, Suckow reports that an epizootic of abortion was brought to an end by suppression of this food in the ration. In the middle ages it was held that the juice of the carrot was an ecbolic?

All these observations, however, ought not to discredit the value of the carrot in the feeding of horses. Every horseman

knows the advantages to be derived from them and accidents seldom occur even with a daily dose of 5 kilos. (11 lb.). Some authors grant to the carrot a prophylactic action against glanders.

(*Revue Générale de Médecine Vétérinaire.*)

[The translator recently made a *post mortem* on a six-year-old cart-mare, in which death appeared to be due to excessive feeding on carrots. The animal failed in her hind legs and dropped down dead in the stable in ten minutes. All the internal organs appeared to be perfectly healthy and the brain and heart were examined minutely. The probability was that carotine had occasioned the death. Any readers of these lines and translations who have noticed bad effects from over-feeding on carrots might furnish interesting records of the occurrence.]

TUBERCULOSIS IN THE DOG.

BY J. E. JOEST.

It has been found in the Pathological Institute of the Dresden Veterinary School that in the *post-mortem* of dogs for the last twenty years 0·83 per cent. have been found affected with tuberculosis.

The examined dogs showed sub-acute miliary tuberculosis of the liver, with tuberculosis of the portal lymphatic glands, tuberculous kidney, widespread pleural tuberculosis with hydrothorax and affected mediastinal, and sternal lymphatic glands, sub-acute miliary tuberculosis of the lungs, chronic tuberculosis of the left auricular appendages of the lung with cavernous formation, tuberculosis of the bronchial lymphatic glands. There was also an acute tuberculosis comprising widespread local infections (lung, pleura, and liver) coincident with slight blood infection (kidneys). It was a noteworthy fact that the pleura tuberculosis showed great similarity to the typical serous tuberculosis of cattle (Perlsucht).

Bacteriological examination showed that in the great majority of the cases the illness was caused by the tubercle bacillus of cattle.

(*Report of the Veterinary College of Dresden*, 1909.)

THE PROPHYLAXIS OF TUBERCULOSIS IN PIGGERIES.

BY EBER.

DURING the last twenty or twenty-five years porcine tuberculosis has extended considerably in Germany. At the Berlin abattoir, for example, in 1885 there were only 8.70 per thousand carcases affected, whereas in 1905 the number was 47.4 per thousand. The anatomo-pathological conditions found lead to the conclusion that in the great majority of cases porcine tuberculosis is a feeding disease due to the ingestion of milk coming from tuberculous cows.

The creation of co-operative dairies, which in later years have developed greatly, constitutes a powerful factor in the propagation of tuberculosis amongst pigs by facilitating the contamination of the milk of a whole neighbourhood. On the other hand, numerous observations show that even after centrifuging it is possible to find tubercle bacilli in the cream as well as in the separated milk. The prophylaxis which will be the most effective will consist in sterilization or pasteurization of all the dairy residues. In all cases, besides, prophylactic work will be properly completed by the application of all measures having for their end the diminution of cases of bovine tuberculosis, by extension of the raising of pigs on pasture, and by elimination of the chances of transmission of human tuberculosis.

(*Revue Générale de Médecine Vétérinaire.*)

Letters and Communications, &c.

Mr. J. A. N. da Cunha; Mr. L. M. Douglas; Mr. E. W. Greening; Captain Nicholas; Mr. R. E. Philp; Mr. T. S. Price; Mr. R. F. Stirling; Board of Agriculture and Fisheries; Department of Agriculture and Technical Instruction for Ireland.

Books and Periodicals, &c., Received.

"Meat and Food Inspectors' Examinations" (Baillière, Tindall, and Cox); Record of Sports (Royal Insurance Company; Bulletins of the Bureau of Sleeping Sickness; Proceedings of the Royal Society of Medicine; Bureau of Animal Industry, U.S.A.; London University Gazette.

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THE

VETERINARY JOURNAL

JUNE, 1911.

Editorial.

THE ROYAL COLLEGE OF VETERINARY SURGEONS.

THERE is no gainsaying that the veterinary profession in the British Isles is at present passing through a very critical stage of its existence, and it is very difficult to see what is in store for us. The advent and steady improvement of the methods of motor traction have been very serious for practitioners in large towns, as may be gathered from the fact that in one practice in London with which we are acquainted well over two thousand horses have been removed from the contract list, having been replaced by motors or driven from the streets by competition with trams, motor omnibuses, and taxi-cabs. However, we are not pessimistic as to the future if only the members of the profession will waken up and see what can be done to minimise the ill effects of outside competition. But we would suggest to our readers, and emphasize the fact, that remedy does not lie in the cut-throat system of competition within our own ranks, an example of which has recently been ventilated in one of our weekly contemporaries. "As one door closes another opens" is an oft repeated axiom, and it is not without application in our own case. In agricultural districts the veterinarian must hold his sway for long years to come, and in towns the increasing fondness on the part of the general public for small pets, and the rising demand for unques-

tionably wholesome meat and milk, are matters which we should do our best to foster.

Then there is that most important matter of the protection of our rights and privileges which is the function of the Royal College of Veterinary Surgeons, and intimately bound with which is the protection of the community against fraudulent quackery. But this involves great expense, and the income of the Royal College of Veterinary Surgeons is rapidly diminishing. This is brought home to us very clearly by the report of the Council for the year 1910-11, during which the expenses have exceeded the income by practically £300. This is a state of affairs that cannot go on for long, and it is very fortunate indeed that in former times we have had business-like men at the head of affairs to husband the resources for these rainy days. Some of the complaints brought forward involve considerable expense, while it is remarkable how easy it is to bring some irregularities to an end. An instance of the latter came under our personal notice only last summer when we were visiting a well-known East coast watering place, where the son of a deceased "Existing Practitioner" was practising under his late father's name. We were informed by the local Member of the Royal College of Veterinary Surgeons that he had complained to the Royal College, who informed him that direct evidence was necessary, and requested him to send either a bill head or circular, or photograph of the brass plate. Our informant felt aggrieved, and thought the Royal College of Veterinary Surgeons should have investigated and procured the necessary evidence themselves. We pointed out to him that if the Council instituted primary investigations in the case of every complaint they would be throwing away a considerable amount of money in conducting wild goose chases. We might also say in passing that this gentleman *was* moreover, an objector to the annual fee proposal. Many of us know the type of man who wants a lot for nothing and thinks he has a right to it! We are glad to say he is now a supporter of the Bill since the true state of affairs has been explained to him. However, we proceeded to take the necessary photograph of an offending door-plate, and must have been observed in the process, for on the following day it had been removed. Unfortunately all

offences are not so easily obliterated. If we are desirous of protection in this and other respects we must be prepared to contribute towards the expense, and we are glad to know that the opposition to the compulsory annual fee has dwindled to an insignificant minority.

With regard to the Bill, it has been read the first time and was to have been brought forward for a second reading on the 26th ult. We regret that it was crowded out on that occasion and was ordered to be brought up again on the 16th inst., when we trust it will meet with a better fate.

Another matter of some importance is referred to in the annual report, with reference to the use of the College Arms and Crest. Contrary to the view generally accepted by practitioners, Members of the College are not entitled to use the Armorial Bearings on stationery without paying the duty. This was an indulgence granted by the Board of Inland Revenue, but could not be claimed as a right, and certain County Councils are now claiming the payment of the statutory licence of one guinea per annum.

The Annual Meeting this year is to be held on June 7, at 12 noon, and in the evening an informal dinner is to take place at the Trocadero at 7 p.m. Some years the meeting has clashed with that classic event The Derby, but it does not do so this year, and we trust a large number will attend both functions, and show their enthusiam for matters professional and social. When things were going well the old British policy of *laissez faire*, was perhaps not so objectionable, but in these times it is essential that we should work together for the common good, and show our belief in our motto *Vis unita fortior*.

General Articles.

THE CLINICAL ASPECT OF JOHNE'S DISEASE AND THE AVIAN TUBERCULIN TEST.*

BY G. P. MALE, M.R.C.V.S.

Reading.

DURING the last few years the pathology and bacteriology of this specific bacterial enteritis has been fairly well made out, and therefore I will not dwell upon it now. As is well-known to you all the causal organism is a small, acid-fast bacillus, closely resembling the tubercle bacillus and having practically the same staining reactions and morphological characters. It is known all over Europe, and appears to affect most of the ruminating animals, as cases are recorded in the sheep, buffalo, and deer, as well as bovines, in which, of course, it is most common. The period of incubation is undoubtedly a long one, and may extend to months or even a year or more, hence the great difficulty of eradicating it from a herd. Probably the only natural method of infection is ingestion, the bacilli being taken in by the mouth with contaminated food. It appears also to be a purely contagious disease, though it does not spread with any rapidity. The disease has been described chiefly in connection with Jersey cattle, but all bovines are susceptible to it, and I have met it in nearly all breeds. Jerseys, however, seem to be more prone to it than any other. The disease is most common in adult cattle, though I have met it in young Jerseys between one and two years old, and in one outbreak three Devon beasts about two years three months were affected at the same time in a herd of ten. The practitioner's attention is not usually called to the disease until diarrhœa has become a marked symptom, but if the animal has been carefully observed there is usually some slight loss of condition and unthriftiness apparent for some time previous without any apparent cause for it. Diarrhœa usually sets

*A paper read before the Royal Counties Veterinary Medical Association.

in suddenly, often after parturition, or as a complication to some other diseased condition. In other cases the onset of diarrhœa is less rapid and the condition assumes a more chronic form. In these latter cases there is no rise in temperature, but in what might be called the acute cases I have sometimes found a temperature ranging from 103° to 105°, lasting for some days, the appetite also being in abeyance. Here the wasting is very rapid and the animal is soon reduced to a skeleton. The more chronic cases gradually get emaciated, but the appetite usually remains good, and even abnormally so, rumination takes place, the eye is bright and pulse normal. This may go on for months till death takes place, which is the invariable rule in all cases where diarrhœa has been a symptom. In some of the chronic cases death may be delayed for many months by careful feeding and astringent medicines, the diarrhœa being held in check. In one in which treatment was adopted the diarrhœa ceased for about a month, only to come on again however with renewed violence. The condition of the fæces is usually fœtid, watery, and contains a number of air bubbles, but as this maintains in other conditions not associated with the Johne's bacillus, it cannot be looked upon as a diagnostic symptom.

Lesions.

The lesions are confined to the intestine and lymphatic glands of the abdomen, but even in these the pathological changes are sometimes not very striking and may easily be overlooked. The commonest situation for distinct lesions is in the posterior end of the small intestine, *i.e.*, the ileum and part of the jejunum; but the anterior part of the large intestine may show marked inflammation and congestion. In advanced cases the lesions are almost characteristic. Even before the ileum is opened it is seen to be distinctly thickened, and if grasped in the hand this thickening can be easily felt. When opened there is seen a marked corrugation of the mucous membrane which is permanent and cannot be effaced by stretching. The surface of the bowel is often inflamed and red, but this is not always so, and sometimes it is quite pale. In other cases the mucous membrane is intensely inflamed, but there is very little thickening or wrinkling. No ulceration is ever observed. The corrugation is sometimes present very

soon after symptoms of diarrhœa are shown. In one case in which a first calving cow was killed a week after diarrhœa commenced, the ileum was distinctly thickened and wrinkled, showing that the condition had been present for some considerable time, although no definite symptom had been shown.

The lymphatic glands may be slightly enlarged and watery. I have several specimens of bowel on view, in some the wrinkling is well marked. In one there is only slight thickening, while in another specimen there was considerable inflammation apparent in the fresh state, but very little wrinkling.

Diagnosis During Life.

This is the most important consideration for the clinician, as he has to decide whether an animal with chronic diarrhœa shall be slaughtered or whether treatment shall be commenced, and if the latter, what success is likely to attend his efforts.

From what has been said before, it can be easily seen that there is nothing characteristic at all about the symptoms that would enable one to distinguish it from diarrhœa due to parasites or other causes, though by weighing up all the history, &c., one can arrive at a fairly safe conclusion in many instances.

The history will usually reveal other cases on the same farm occurring sporadically for perhaps a number of years. Usually only one animal is affected out of a number, and it is generally an adult one. In parasitic gastritis usually a *number of young* animals are affected at the same time. If tuberculosis is present other signs of that condition will be noticed, *e.g.*, cough, and respiratory abnormalities, whereas in Johne's disease there is no cough, and if the ordinary tuberculin test is applied there is no reaction. It has been said that it can be diagnosed by a microscopical examination of the fæces for acid-fast bacilli, but it is only occasionally that one can find these bacilli in sufficient numbers in the fæces to warrant a diagnosis, and then one must be certain that they are not tubercle bacilli. I have tried the method of obtaining bacilli by scraping the wall of the rectum with the finger-nail, spreading on a slide, and examining for the bacilli, but without success. Moreover, failure to find bacilli would prove nothing, as the bacilli are not always present in the rectum. We must therefore look to another agent. Bang (Junr.) discovered that when tuberculin prepared from avian T.B. was injected into

an affected animal, a more or less decided reaction occurred. This method I have employed with avian tuberculin, kindly given me by Mr. Stockman, with the following results:—

Herd 1.—Jerseys, consisting of 1 bull, 10 cows, and 8 heifers and calves were tested, and 2 cows and 2 heifers gave the following reactions; the others showed no rise in temperature:—

	Time of Injection		9th hour		12th hour		15th hour
(*a*)	100.4	...	104	...	103.2	...	101
(*b*)	101	...	102	...	104	...	101.4
(*c*)	101	...	102	...	104	...	105
(*d*)	101.4	...	101.4	...	103.2	...	99.2

(*a*) Had diarrhœa at the time of injection, was slaughtered and proved to be affected with Johne's disease. Sir J. McFadyean most kindly confirmed the diagnosis.

(*b*) Was isolated from the herd and some weeks afterwards developed diarrhœa. She was at once slaughtered, and on *post-mortem* examination the characteristic thickening of the bowel wall was seen and a bacteriological examination showed the presence of acid-fast bacilli.

(*c*) Was slaughtered and was found to have the disease.

(*d*) Was afterwards tested with ordinary tuberculin, but gave no reaction. She was slaughtered and the bowel was examined by Mr. Stockman, and although he was unable to find the bacillus in the specimen sent, he gave it as his decided opinion that it was a case of Johne's disease. It may be suggested that perhaps these cows had tuberculosis? This is negatived by *post-mortem* examination and failure to react to the tuberculin test, which had previously been applied to all but the calves. It may be said also that the fact of four reacting and having the disease at *post-mortem* examination does not prove that the others which did *not* react were healthy. Against this there is the fact that there have been no cases for the last twelve months, though previously they were seen every few months.

As I shall show later, although preventive measures were employed and the cattle put on fresh pasture for six months, cases still occurred before the animals were subjected to the test.

Herd 2.—Thirty-two Jerseys of all ages, tested with avian tuberculin last May. Five gave a positive and one I classed as a

doubtful reaction, viz., 26. The temperatures of the reactors are as follows:—

No.	Time of Injection	9th hour	12th hour	15th hour
5	101.2	101	103.8	103.8
8	101	103.2	101.4	101
20	101	104	102.4	102.2
24	101.8	101.8	103.2	104
29	101	101	105	102
26	102	102	103.2	103.6

Unfortunately circumstances did not permit of my proving the correctness of the test, for these animals were sent away from the farm immediately. It is significant, however, that there has not been another case of Johne's disease since, though previously it was common. Also all these animals were distinctly unthrifty and I was able to pick most of them out from a number of the herd two days after the test, although I had not seen them personally before.

Two suspected cases which I tested recently occurring on separate farms where there is no history of previous disease, gave the following reactions:—

No.	Time of Injection	9th hour	12th hour	15th hour	18th hour
(1)	101	101.4	102	101.2	101
(2)	100.2	102	101.2	101	101

In both these cases the small intestines were inflamed and somewhat thickened, but there were no characteristic corrugations as are met in the most typical cases of Johne's disease, although both cows had been affected for several months with profuse and persistent diarrhœa.

The bowels of No. 1 were examined bacteriologically for Johne's bacilli by Sir J. McFadyean, who failed to find any acid-fast bacilli. My assistant, Mr. Dunn, searched most carefully in the second case for bacilli, but without result. This bears out the test, which gave practically a negative result, the rise in temperature being only a slight one in each case.

I might say that both these cows had been previously tested with ordinary tuberculin but gave no reaction.

Failure to find the bacilli does not, of course, prove that these

animals were *not* affected with the disease, but taking the negative result of the test also into consideration it may point to some other irritant as being the cause of the diarrhœa, &c., and if so we may not be right in ascribing every case of persistent chronic diarrhœa and wasting where parasites or tuberculous lesions are not found at *post-mortem* examination, to Johne's disease.

This, I think, should be borne in mind in any legislation that may be forthcoming in this connection.

Treatment.—Several agents have been put forward as cures for this disease, but up to the present I have been unable to find one effectual. In turn I have used all kinds of astringents, antiseptics, and tonics, with no permanent results, although in several cases treatment has been commenced the instant diarrhœa started, and persisted with for considerable periods. Tobacco in the form of balls, copper sulphate solutions, perchloride of iron solutions, nitro-hydrochloric acid, sulphuric acid, &c., have been employed, but undoubtedly I obtained the best results from cyllin given diluted in drachm doses once or twice daily. In several cases the diarrhœa has been held in check for days, and in one case for weeks. Of course the actions of medicines were aided by good concentrated food, warm, comfortable byres, &c.

The conclusion is forced upon me that by the time symptoms of diarrhœa are shown the disease has been present for some considerable time and the bowels are so badly involved that treatment *must* prove quite ineffectual.

I am in hopes, however, that with the avian tuberçulin test the disease will be discovered in its early stages, and then treatment may be commenced with much greater hopes of success.

Preventive measures are rendered most difficult on account of the long incubation period, during which the animals must be voiding large numbers of bacilli, infecting byres, grass land, &c., on which they graze.

No reliable data have as yet, I believe, been collected as to how long the bacilli may live outside the body in a soil.

In one farm I advised that all cattle should be removed from the usual pastures and put on to fresh ground and only horses allowed there for six months, the pasture land and ponds, &c., in the meantime, being dressed with 5 cwt. each of salt and lime. This was carried out, but I regret to say it appeared to have no effect on the occurrence of the disease.

From my present knowledge I can understand this. Probably many animals were already affected, but showed no evidence of it and were carrying the bacilli in their bodies. The only hope, therefore, of eradicating it lies in the test. If all those *reacting* are *isolated,* whether showing symptoms or not, the disease may perhaps be stamped out of a herd. As I indicated, this was done with a Jersey herd last May, and I am glad to say up to the present there has been no recurrence of the disease; but, of course, the time is still short. Until more is known about this condition it is difficult for the State to frame regulations to combat it, but it is now so widespread and works such havoc with our dairy herds that it is to be hoped some measures may be adopted in the near future to prevent affected animals from being exposed and sold in the open markets, and so being a source of infection to others.

TUBERCULIN AS A DIAGNOSTIC AGENT.*

By ARTHUR R. LITTELJOHN, L.R.C.P., M.R.C.V.S., D.P.H.
Assistant Medical Officer, London County Asylum, Hanwell.

TUBERCULIN was first introduced in 1890 by Koch, who at the time thought he had discovered a curative agent for tuberculous infections. Since then, however, he and many others have brought out modifications of the original tuberculin. Koch's original tuberculin is known as "Old Tuberculin" in contradistinction to "New Tuberculin," which was introduced by him in 1897.

The *Old Tuberculin* he prepared by growing tubercle bacilli in glycerine bouillon for some weeks and then killing them by heat. The broth was finally concentrated and filtered free of bacilli. In minute doses, hypodermically, in a healthy individual it is responsible for no apparent changes, but in a tuberculous subject such an injection causes malaise, marked elevation of temperature, the formation of sloughs on the surface of existing tuberculous glands, and swelling of existing tuberculous glands, &c.

* Read at the Birkenhead Congress, 1910. From the *Journal of the Royal Institute of Public Health.*

The *New Tuberculin* he prepared by growing bacilli as in the preparation of "Old Tuberculin," separating the bacilli, drying them *in vacuo*, and triturating them by machinery. From this powder of tubercle bacilli Koch obtained three varieties of "New Tuberculin":—

(1) T. A. (Alkaline Tuberculin). This is prepared by stirring and shaking the powdered bacilli in a 10 per cent. solution of caustic soda and then filtering.

(2) T. O. (O—ober—upper). After trituration of the cultivated tubercle bacilli they are emulsified in distilled water and the whole centrifugalized. This separates the emulsion into two layers, the upper of which is free from bacilli. This upper layer is drawn off and constitutes T. O.

(3) T. R. (R—residue). In the preparation of T. O. after centrifugalizing and removing the upper liquid, there remains a muddy residue. This residue is collected, dried, triturated, emulsified with distilled water and again centrifugalized. As in the preceding process the emulsion separates into two layers. The lower layer or residue is several times subjected to similar treatment until no residue is left. After each centrifugalization the upper layer is collected, and in the end these layers are all mixed, constituting T. R.

From the foregoing it will be seen that "Old Tuberculin" contains neither bacilli nor remnants of bacilli, but consists solely of the concentrated glycerine broth containing the extra-cellular or excreted toxins of the bacilli. "New Tuberculin," on the other hand, contains none of the excreted toxins, but owes its activity to the intracellular toxins contained in the protoplasm of the bacilli which toxins after destruction of the bacilli are dissolved in the distilled water.

For purposes of diagnosis it is the "Old Tuberculin" that is used, "New Tuberculin" being used for treatment.

THE SUBCUTANEOUS OR GENERAL TEST.

Man.

In man the administration of "Old Tuberculin" subcutaneously for purposes of diagnosis has been almost entirely given up, owing to the serious constitutional disturbance resulting, and also to the fact that some cases of latent tuberculosis

have, with disastrous results, apparently been restarted in activity.

Method.—In cases of suspected tuberculosis the usual dose is 0.001 c.c. of "Old Tuberculin" for adults, half that dose for children over 5, and quarter that dose for those under 5. This is injected under the skin, usually of the forearm.

Reaction.—If the patient is tuberculous a reaction will follow within forty-eight hours of the injection, and is shown by malaise, constitutional disturbance, and a rise of temperature 1° to 2° F.

Calmette (*Brit. Med. Journ.*, August 28, 1909), discussing the use of the subcutaneous reaction in man, draws attention to the following disadvantages:—

(1) The general febrile reaction produced is accompanied by a congestive reaction of the tuberculous foci, which may result in dangerous diffusion of tubercle bacilli.

(2) It is useless for febrile patients or those with an irregular temperature.

(3) Aggravation of the disease has been rightly or wrongly attributed to the injection. Wolff-Eisner (*Brit. Med. Journ.*, March 13, 1909) states that a positive reaction to Koch's subcutaneous injection indicates tuberculosis not necessarily active, and has been obtained in 50 to 80 per cent. of persons apparently healthy.

Cattle.

In cattle the subcutaneous test is now very widely adopted and is considered by many as an almost infallible test for tuberculosis.

Method.—The usual method adopted is to keep the cattle in the shed, fed on their usual food and protected from draughts. The temperature is taken at least once on the day preceding the test, again at the time of making the test, and at the ninth, twelfth, and fifteenth hour after the injection. They should not be allowed to drink large quantities of water between the sixth and fifteenth hour after injection. The dose is 50 minims of "Old Tuberculin," but may be varied above or below this quantity according to the size of the animal. A clean hypodermic syringe should be used and the whole of the dose should be injected under the skin in some convenient place, such as behind the elbow.

Reaction.—If due aseptic precautions are taken the local reaction is always slight, but Vallée has shown that tuberculous animals slaughtered shortly after the injection of tuberculin invariably show some swelling and congestion at the site of the inoculation. The general reaction is shown by more or less constitutional disturbance and elevation of temperature. Cattle in which the temperature, during the fifteen hours following the injection, rises gradually to 104° F. or more may be classed as tuberculous; those in which the temperature remains under 103° F. may be classed as non-tuberculous; and those in which the maximum temperature is under 104° F., but over 103° F., should be regarded as doubtful and should be retested after a month's interval.

Without the aid of tuberculin a large majority of the cases of tuberculosis in cattle would be overlooked, as it is not till the advanced stages are reached that the disease can be recognized clinically. An animal giving an undoubted thermal and general reaction to a dose of tuberculin hypodermically can safely be said to contain one or more tuberculous lesions in some part of its body. According to Melvin (*Brit. Med. Journ.*, October 24, 1908), out of 23,869 reacting animals slaughtered, 23,585 (98.8 per cent.) showed tuberculous lesions. He holds that properly prepared tuberculin is a very reliable diagnostic, if applied by a competent person, and that unsatisfactory results are due usually to poor tuberculin and ignorance or carelessness on the part of the observer. Arloing (*American Veterinary Review*, November, 1908) also states that in his opinion a positive reaction is certain evidence of the presence of tuberculosis. The absence at the *post mortem* of naked-eye lesions in a reacting animal is no criterion that the test is at fault, as inoculation of test animals has in many cases proved the presence of tubercle bacilli in the organs of the reactor.

In cattle the subcutaneous test does not appear to have the serious disadvantages already mentioned as occurring to man, but it is not, however, free from disadvantages; for instance:—

(1) It cannot be carried out on cattle with a high initial temperature—*i.e.*, over 103° F.

(2) It is not unusual to get numerous uncertain reactions (*i.e.*, the temperature rising to between 103° and 104° F.), in which case a retest is necessary, and for this several weeks'

interval is usually required. Vallée, however, in such cases recommends giving double the dose of tuberculin and taking the temperature two-hourly during the subsequent fifteen hours. He holds that by this means a reaction is obtainable in cattle tested only thirty-six hours previously.

(3) Again, animals repeatedly inoculated with tuberculin acquire a tolerance for it, and though tuberculous will fail to react to the ordinary dose. Unscrupulous owners, in order to defeat the test, have been known to dose the cattle by injecting one or more doses during the day preceding the official test.

(4) The thermal reaction is to a large extent prevented by the administration of antipyretic drugs after the subcutaneous injection. This method has also been adopted by unscrupulous owners for purposes of deceit.

(5) Lastly, animals in advanced stages of tuberculosis frequently fail to give the reaction.

These defects render the "subcutaneous test" not all that is desired, and other methods of "testing" have been tried. None of them, however, have succeeded in replacing the original test, though some of them might with advantage be carried out coincidentally.

Having dealt at some length with the "original or subcutaneous test" we come to the various local reactions that are obtained with tuberculin. Speaking of these Vallée says: "It seems incontestable that the reactions of a tissue under the influence of tuberculin reveal a tuberculous infection of the organism (*Proc. Soc. Cent. de Méd. Vét.*, October 15, 1908).

One of the first local reactions introduced was the conjunctival or ophthalmic reaction of Wolff-Eisner and Calmette

The Conjunctival Test.

This method of obtaining a reaction was in 1907 introduced independently both by Calmette and Wolff-Eisner for the purpose of detecting tuberculosis in man. Wolff-Eisner used a 10 per cent. solution of "Old Tuberculin," but Calmette used a special tuberculin prepared by precipitating "Old Tuberculin" in alcohol, drying it and dissolving it in sterile water or normal saline. By this means he avoided the presence of glycerine and bouillon, which he thought might act as an irritant. His fears, however, were unfounded, and both forms of tuberculin are now in use for this reaction. Calmette recommends a 1 per cent.

solution, but more recent investigators recommend half this strength.

Man.

Method.—The lower eyelid is drawn down, while the patient is told to look upwards, and a drop of the solution is allowed to fall into the lower sac. The lower lid is kept pulled down to distribute the fluid, and to avoid its escape by movement. The other eye is left untested as a control for comparison.

Reaction.—A few hours after instillation, itching and smarting commence at the internal canthus, followed by lachrymation, exudation, redness and swelling of the conjunctiva most noticeable at, and in some cases limited to, the semilunar fold and caruncle (Barney and Brooke). All these symptoms are usually noticeable in three to twelve hours, but may not appear for twenty-four or more hours. They usually persist for two to four days—in severe reactions for a week. There should be little or no pain, and no constitutional disturbance.

Precautions.—(1) Since a single drop of 1 per cent. solution of tuberculin occasionally produced intense inflammation, many observers now use a ½ per cent. solution (Cornby).

(2) After instillation, the eye must not be rubbed or exposed to wind or dust.

(3) In doubtful cases in which a second test is considered necessary, the other eye should be tested and a stronger solution of tuberculin (1 per cent.) used.

(4) Avoid applying the test to an eye in any way diseased, refraction errors excluded.

Dangers.—Intense inflammation, ulceration, and subsequent nebulæ are rare, but have been recorded (Harrison Butler). Such severe sequelæ are long-lasting and require active treatment.

Statistics show that in man the reaction fails to occur in some tuberculous patients and appears in others not obviously tuberculous. It also fails in advanced cases nearing death, owing to loss of resisting powers in the patient, and in general miliary tuberculosis and tuberculous meningitis. Other diseases, such as typhoid, gonorrhœa, and rheumatism, have been recorded as causing a positive reaction. Many of the clinically non-tuberculous that react are possible tuberculous, and many observers hold that the percentage of apparent errors is well within the limits of possible accuracy. Baldwin (*Brit. Med. Journ.*, October 24,

1908) gives records of 887 patients tested, $\frac{1}{4}$ per cent. solution of dried purified "Old Tuberculin" being employed. Those that did not react positively were retested with $\frac{1}{2}$ per cent. solution in the opposite eye. Of these 887, 310 were tuberculous in some form; 208 (70 per cent.) of these reacted positively to the conjunctival test; of 265 suspected of being tuberculous 35.9 per cent. reacted positively; of 127 suffering from other diseases 14.1 per cent. reacted positively, and of 185 supposed to be healthy 18.3 per cent. gave a positive reaction. Out of all these positive reactions twenty-four only were severe, and ten of these severe cases persisted beyond five days, one developing keratitis (a scrofulous patient).

According to Wolff-Eisner (*Brit. Med. Journ.*, March 13, 1909), a healthy person will not react, and an apparently healthy person that does so usually turns out to be tuberculous. Failure to react, however, does not exclude tuberculosis, and in cases obviously tuberculous may be regarded as a bad prognostic. He does not consider the test dangerous to a healthy eye, provided it is not repeated in the same eye. Marique (*Brit. Med. Journ.*, September 12, 1908) obtained some reactions so violent and prolonged that he abandoned the method; nor does he, in view of its unreliability, think one is justified in exposing a patient to such very real risks. Calmette (*Brit. Med. Journ.*, August 28, 1909) considers a positive reaction is only obtained when the tuberculous focus contains living tubercle bacilli, and that the rapidity and intensity of the reaction depends upon the subject's vigour of defence against tuberculous infection. As in the cutaneous and subcutaneous methods, he expects a negative reaction in old cachectic tuberculous subjects. He records that out of 20,000 observations 92 per cent. of the clinically tuberculous gave a positive reaction, and only 80.4 per cent. showed serious results such as ulceration, intense conjunctivitis, &c. Among febrile patients he considers it the only test which is neither inconvenient nor dangerous.

Cattle.

Vallée was probably the first to apply the conjunctival test for diagnostic purposes in cattle. The results of experience have shown that in cattle any aqueous solution of tuberculin prepared according to Calmette's directions is unsatisfactory, better results

being obtained by using ordinary concentrated tuberculin, prepared without glycerine or carbolic acid, both of which are irritants.

Method.—The animal's head is held in a raised position, the membrana nictitans is everted by gentle pressure, and two or three drops of tuberculin instilled into the conjunctival sac. A few drops of saline or sterilized water may be dropped into the opposite eye as a control.

Reaction.—This consists in the appearance of a more or less marked conjunctivitis in from eight to twenty hours after instillation of the tuberculin. There is marked dilatation of the blood-vessels of the conjunctiva, œdema and swelling of the eyelids, and lachrymation. In more intense reactions a greyish-white exudate forms in films which are washed by the tears to the internal canthus. In very marked cases there is epiphora, photophobia, and glueing together of the eyelids by a greyish-yellow exudate. The reaction is most marked about fifteen to twenty hours after instillation, but may appear as early as the eighth hour. It may remain in evidence for some three to four days. It causes neither general nor thermal disturbance.

McCampbell and White (*Brit. Med. Journ.*, October 24, 1908) obtained the best results by using full-strength tuberculin. They, however, consider the test of limited value, as in some cases the reaction is barely a hyperæmia; but they hold that a positive reaction is sure evidence of a tuberculous lesion being present. They found that the reaction was most marked in animals not recently submitted to the subcutaneous test, which prevents the reaction for the next four weeks and diminishes its intensity for from six weeks to a year. Mohler (*American Veterinary Review*, vol. xxxiv, December, 1908) considers that the variable results obtained by this method make it unreliable and unsatisfactory. Roencke (*Journ. Comp. Path.*, vol. xxi, part iii, September, 1908) holds that as a diagnostic this method it not so reliable as the subcutaneous. Vallée asserts that if the animal be capable of reacting at all, it will do so in spite of a previous subcutaneous injection of tuberculin, and also that repetition of the test does not diminish the reaction. He records that out of eight animals of which the same eye was instilled four times in nineteen days, all gave a marked reaction on each occasion; in fact, the reaction became more intense on each successive test.

I (*Journ. Comp. Path.*, vol. xxii, part iii, September, 1909) found that out of sixty-four cows tested by this method and judged by the result of the subcutaneous test, 11.5 per cent. (three out of twenty-six) of the tuberculous animals failed to give a conjunctival reaction, and 26.9 per cent. (seven out of twenty-six) gave a barely perceptible reaction. In this series of tests, also, the reaction was most marked on the fifth day after instillation.

The Commission appointed by the Société de Pathologie comparée (Bailliart's Report) was of opinion (1) that the conjunctival test is usually without danger, if the eye is free from tuberculous disease; but that occasionally transient accidents occur; (2) that the reaction is not proportionate to the gravity of the lesion and is often absent in the last stages of tuberculosis; (3) that the reaction is not reliable, is often doubtful, and cannot replace the subcutaneous test; (4) that it occasionally causes a general reaction but that this is always slight and transient.

Conclusions.

Man.—The conjunctival test has occasionally had results disastrous to the eye; for this reason and because its uncertain efficiency does not appear to justify such risks, it has been abandoned in many of the hospitals and sanatoria in this country.

Cattle.—The test does not appear to be dangerous, but it is unreliable and cannot be used as a substitute for the more reliable subcutaneous test. It is, however, a quick and convenient method of weeding out tuberculous cattle from a large herd, and in these cases is most useful if carried out as a preliminary to the subcutaneous test (Lignières, *Journ. Comp. Path.*, vol. xxii, part iii, September, 1909).

The Combined Ophthalmo-cutaneous Test.

Cattle.

Guerin and others pointed out that tuberculous animals first tested by the instillation of tuberculin into an eye and subsequently, within a few days, by the subcutaneous injection of tuberculin, often showed an intensified revival of the conjunctival reaction in the eye first tested (secondary reaction). Moreover, in some cases where no reaction was obtained by simple instillation (primary reaction) an appreciable conjunctival reaction was obtained after the subcutaneous injection.

Jugeat (*Journ. Comp. Path.*, vol. xi, part iv, December, 1908) records 159 animals tested, first with the conjunctival reaction and at a later date with a subcutaneous injection of tuberculin. He found that in 18 per cent. the simple (primary) conjunctival reaction and the subcutaneous test disagreed, whilst in only 8 per cent. did the secondary conjunctival reaction and the subcutaneous test disagree. He therefore considered the secondary conjunctival reaction more reliable than the primary. Morel (*Journ. Comp. Path.*, vol. xxi) considers it very rare to obtain a well-marked secondary ocular reaction (*i.e.*, muco-purulent exudate) in a cow that is not tuberculous. Bailliart (*Journ. Comp. Path.*, vol. xxi) is of the same opinion and recommends the secondary reaction, as he considers it essential to have a test too severe rather than too lenient. The secondary reaction has this advantage also—it reveals the fraudulent attempt of faking an animal by subcutaneous injection prior to the official test. As a subsequent submittal to this combined test obtains the secondary conjunctival reaction in tuberculous cattle, the Société de pathologie comparée (*Brit. Med. Journ.*, October 24, 1908) considered (1) the primary reaction unreliable, but the secondary reaction less so; (2) that in the majority of cases the secondary conjunctival reaction and the subcutaneous test agreed; (3) that it is more frequent to find a positive secondary conjunctival reaction in a non-tuberculous animal than a negative reaction in a tuberculous one; (4) that a reaction is often absent in the last stages of tuberculosis.

I (*Journ. Comp. Path.*, vol. xxii, part iii, September, 1909) applied the combined ophthalmo-cutaneous test to sixty-four cattle, subjecting them to the "subcutaneous test" on the seventh day after instillation of the eye with tuberculin; and found that out of twenty-six animals that reacted positively to the "subcutaneous test," three (11.5 per cent.) failed to react to the primary conjunctical test, and seven (26.9 per cent.) gave a very slight reaction. But all twenty-six cattle gave a marked secondary conjunctival reaction. One cow, which failed to react to the "subcutaneous test," gave both a marked primary and marked secondary conjunctival reaction. In this series of investigations it was found that the secondary conjunctival reaction was most marked at the fifteenth hour after subcutaneous injection.

The Cuti Reaction.

This reaction was first described by Von Pirquet in 1907. He found that applying a drop of Koch's "Old Tuberculin" to the abraided skin of a tuberculous child resulted in a local reaction unaccompanied by any general disturbance. He found it was more feebly shown in tuberculous adults and in non-tuberculous children he failed to obtain the reaction. For carrying out the test Von Pirquet now recommends using Koch's "Old Tuberculin" in 25 per cent. solution, using as a diluent one part of 5 per cent. carbolic-acid solution, and glycerine with two parts of normal saline; weaker solutions are, however, recommended by other investigators.

Man.

Method.—Von Pirquet's original method was to clean the skin with ether, apply one or two drops of the tuberculin to it, and with a special needle make an abrasion in the skin through the tuberculin. For comparison a similar abrasion without tuberculin was made on the same arm. McNeil (*Brit. Med. Journ.*, November 6, 1909) draws attention to the superficial circulation being less accessible in the skin than the conjunctiva and recommends a careful technique, which he considers most important in order to obtain the best results. His modification is to clean the skin with ether, and then carefully chafe off the epidermis with a sharp needle until the pink cutis vera is exposed, but without "drawing blood." To this area he applies a drop of undiluted "Old Tuberculin" and rubs it in with the head of the needle. A control is made on the same arm, using 50 per cent. glycerine instead of tuberculin.

Reaction.—In twenty-four hours (early reaction) there forms at the site of inoculation a hyperæmic papule with an infiltrated base, surrounded by a bright red zone the size of a shilling. Vesicles develop on the papule, break, and scab. Resolution commences about the fourth or sixth day, and is complete in another four days, leaving a pigmented area to mark the site of the reaction. The lesion, to be typical, must have an infiltrated base and a sharp margin to the hyperæmic zone, and must also persist for at least five days. Control areas often show some congestion and swelling, but these pass off in twenty-four hours. In older children and adults the reaction is often delayed until

the forty-eighth hour (late reaction). There should be no general or thermal reaction.

McNeil, as the result of investigations in 150 patients, considers the test unreliable in advanced tuberculosis, but quite reliable in the early and chronic stages. He holds that a positive reaction is proof of tuberculous disease, whether or not the latter be clinically manifest. He found that if the general condition of the patient remain unchanged, the reaction is not prevented by repetition. Mills (*Brit. Med. Journ.*, May 14, 1910), as the result of 223 investigations, found that tuberculous patients rarely failed to give the reaction, that repetition does not prevent the reaction, and that bovine tuberculin may be used for man with results as successful as when tuberculin of human origin is employed.

McNeil, in comparing this skin reaction with that of the conjunctiva, found that the latter never gave a positive reaction in any case not positive by Von Pirquet's test, but that ten out of seventy-eight were positive to Von Pirquet's and failed to give a conjunctival reaction. He therefore considers the cuti reaction more reliable than the conjunctival. Speaking generally, statistics show that about 90 per cent. of tuberculous children give a positive reaction to this cuti test.

Cattle.

Vallée was the first to apply the test to cattle. As the site of inoculation he selected the back of the neck or the withers.

Method.—He first shaved the skin and washed it with sterilized water; then lightly scarified through the epidermis and dermis until blood began to ooze. Using a sterilized brush he painted this area with Koch's "Old Tuberculin" (diluted with an equal part of boiled water).

Reaction.—About twenty hours after inoculation an œdematous swelling appeared along the lines of scarification, and increased to its maximum during the next twenty-eight hours. The swelling persisted for four to five days, when a crop of papules appeared which lasted some two or three days before desquamating, and leaving a surface from which serum oozed. Resolution usually occurred about the eighth to the fifteenth day. In cases scarified too deeply there was much induration and considerable hyperæsthesia of the part. In no case was there any general

or thermal disturbance. In healthy cattle the resulting redness and swelling was very transient. Comparing this reaction with the subcutaneous test, Vallée found (1) that cattle giving a marked subcutaneous reaction gave also a good cuti reaction, but the intensity of the latter was not proportionate to the extent of the tuberculosis; (2) that a subcutaneous injection of tuberculin two to three days prior to the cuti test considerably diminished the action of the latter; (3) that tuberculous cattle injected subcutaneously with tuberculin on the fifth day of the cuti reaction gave a pronounced typical temperature reaction, in addition to the cuti reaction already in evidence.

Vallée has shown that, as to the subcutaneous reaction, cattle acquire a tolerance to the cuti reaction, and he recommends that four or more weeks be allowed to elapse before repeating the test. Reinecke (*Journ. Comp. Path.*, September, 1908), in carrying out his investigations, shaved and cleansed the withers, and used an instrument consisting of eight small blades 5 mm. apart, which were sufficiently long to "draw blood." He used concentrated "Old Tuberculin" diluted with an equal part of boiled water, and applied with a sterilized brush. Of the twenty-five animals tested only one reacted, and this one showed no tuberculous focus on *post mortem*. The subcutaneous test showed six of these to be tuberculous, and *post-mortem* examination revealed eight more.

It has been established that animals which react to the subcutaneous test may fail to react to the cuti test; so that apparently the reliability of the latter does not compare favourably with the ordinary subcutaneous test.

The Dermo Reaction.

Man.

Moro found that in a tuberculous man a skin reaction could be obtained with tuberculin, applied by gentle friction, without previous scarification. He used an ointment consisting of equal parts of "Old Tuberculin" and lanoline. This he rubbed into the skin of the chest or abdomen, and in a tuberculous subject obtained either an eruption of red papules or a diffuse dermatitis of the part. This reaction, though interesting, is not reliable, and cannot be considered trustworthy.

Cattle.

Lignière carried out similar investigations in cattle. He obtained a local reaction in tuberculous cattle by rubbing a shaved area of skin with concentrated tuberculin. He selected the loose skin of the side of the neck, shaved a few square inches of it, and rubbed in several drops of "Old Tuberculin." In tuberculous cattle, in about twenty-four hours, the skin became swollen and red, and developed a crop of vesicles; but in healthy cattle no such reaction occurred. The reaction varied greatly in severity, was unaccompanied by any thermal disturbance, and persisted for several days. A subcutaneous injection of tuberculin given at the same time did not affect the reaction; but an injection two or three days previously prohibited or, at the least, delayed it.

Vallée (*Proc. Soc. Cent. de Méd. Vét.*, October 16, 1908) carried out this test on eighteen cattle that had reacted to the subcutaneous test, and that at a subsequent *post-mortem* examination proved to be tuberculous; ten only, however, gave a distinct and characteristic reaction, whilst five failed to react at all.

The Intradermic Reaction.

Like the dermo reaction, this is a modification of Von Pirquet's scarification method, the tuberculin being injected into the thickness of the skin.

Man.

Mantoux found that in man an injection of tuberculin (1/100 mg. for children) into the thickness of the skin resulted in a distinct local reaction in tuberculous subjects, and without either thermal or constitutional disturbance.

Cattle.

Moussu applied this method to cattle, selecting the fold of skin at the root of the tail, so as to conveniently compare the other fold. He injected two drops of 10 per cent. "Old Tuberculin" into the thickness of the skin. In non-tuberculous cattle this resulted in no local reaction, but in tuberculous cattle an œdematous swelling, the size of a walnut, developed, and persisted three or four days. He found that tuberculous cattle never failed to give a reaction, and he obtained equally successful

results with swine, goats, and sheep. In swine, however, the swelling showed a hæmorrhagic area, which remained four or five days after subsidence of the swelling. A subcutaneous injection of tuberculin a day or so prior to carrying out this test prevents the reaction, but the intradermic test does not interfere with a subsequent subcutaneous test.

Vallée (*Proc. Soc. Cent. de Méd. Vét.*, October 15, 1908) carried out this test on seven tuberculous cattle, and obtained five positive reactions and two failures.

The Comparison of the Various Methods in Cattle.

In comparing the practical value of the various tuberculin tests, none of the local methods give sufficiently reliable results to warrant their substitution for the subcutaneous test, which must still be considered the most satisfactory. There are, however, instances where, from one cause or another, the subcutaneous test cannot be adopted, and one needs then to adopt the most reliable local method or methods. If the general test cannot be adopted because of thermal oscillation or hyperpyrexia, the most reliable results will be obtained by the secondary conjunctival reaction. Of the other local tests the most reliable is probably the intradermic method; but there is no reason why several of the local reactions should not be carried out simultaneously.

COMPARATIVE ANATOMY OF SUPERNUMERARY DIGITS IN CERTAIN UNGULATES AS EVIDENCE OF THE INTER-RELATIONSHIP EXISTING BETWEEN THE VARIOUS SPECIES.

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Second Article.*

Case III.

The third case was one of the most interesting of the series of cases. It consisted of the metacarpal and digital portions of the left limb of a pony which possessed an external accessory digit presenting a very high degree of organization.

* The first article of this series was published in The Veterinary Journal for March, 1911.

A superficial examination revealed an abnormal breadth at the metacarpo-phalangeal joint, and below the joint there were two digits distinctly separated from each other. The outer digit was the smaller, the toe of the hoof of which extended to a point about midway down the anterior surface of the hoof of the other digit upon which it lay. Its palmar aspect fell short of the level of the palmar aspect of the other digit by about half an inch, so that it was not weight-bearing.

A well-marked vertical fissure could be felt at the front of the fetlock slightly to the outer side of the middle line.

At first glance this specimen appeared to belong to the Schistodactyles of Lesbre, with one of the digits slightly deformed, but a detail examination showed it to be a member of the Polydactyles.

The Tendons.—The tendon of the anterior extensor of the digit (extensor pedis) ran down the antero-external border of the large metacarpal bone. At the junction of the middle and lower thirds of the bone it split into two divisions, the larger of which passed over the front of the fetlock joint of the principal digit and broadened out on the front of the first phalanx. Midway down the shaft of this bone, a branch of the superior sesamoidean ligament which made its appearance round the inner aspect of this digit, blended with the inner edge of the tendon, and the latter then passed over the first interphalangeal (or pastern) joint and continued its course in the middle line to its insertion into the pyramidal process of the terminal phalanx. At the pastern joint it took the place of an anterior common ligament and gave support by its deep face to the synovial membrane of the joint.

The other division of the tendon separated at an acute angle and then passed obliquely downwards and outwards on the anterior face of the other digit. Running over the front of the fetlock joint of this digit it detached a small slip of insertion into the upper extremity of its first phalanx, to the outer side of which the slip was attached. The tendon then passed as a narrow cord down the front of the first phalanx and over the first interphalangeal joint, where it became slightly expanded. Its insertion was into the proximal extremity of the third phalanx in the elevation which corresponded to the pyramidal process. The tendon of the superficial flexor of the digit (flexor perforatus) presented no peculiarity until the lower third of the metacarpal region was

reached, when it divided. The inner and larger division passed straight down the limb over the back of the fetlock, formed the usual fibrous tube for the passage of the tendon of the flexor perforans, and then split into two portions, which were attached one on either side of the second phalanx at the posterior aspect of its upper extremity. The other division running obliquely downwards and outwards gained the posterior surface of the expanded portion of the sesamoid bone of the accessory digit over which it played as a tube which enclosed the corresponding portion of the tendon of the deep flexor. It did not divide, but was inserted as a broad band into the back of the upper extremity of the first phalanx.

The tendon of the deep flexor (flexor perforans) also divided between the middle and inferior thirds of the metacarpal region into two portions, one of which ran down the back of the principal digit to be inserted into the semilunar crest of its terminal phalanx after emerging from the tube formed for it by the tendon of the superficial flexor. The other division took a similar course in relation to the portion of the superficial flexor tendon on the back of the smaller digit, and was inserted into the inferior aspect of its terminal phalanx.

The Suspensory (or Superior Sesamoidean) Ligament.—This structure was particularly well developed. It had the usual origin from the back of the lower row of carpal bones and the upper extremity of the large metacarpal. Running down the channel formed between the large and two small metacarpal bones, it divided into two portions at the middle third of the metacarpus. The larger division, as might be expected, ran down the back of the larger digit, but after a course of about an inch this portion divided and the outer division took a vertical course downwards. It obtained insertion into the apex of the outer sesamoid bone of this digit. The inner division took an oblique course downwards and inwards, and after giving a slip of insertion to the postero-external surface of the corresponding seseamoid bone, it passed obliquely round the side of the metacarpo-phalangeal joint and blended with the tendon of the extensor pedis on the front of the middle third of the first phalanx.

The smaller of the two divisions of the main ligament passed obliquely downwards and outwards along the back of the outer small metacarpal bone and in intimate relationship to it. About

an inch above the fetlock joint of this digit, the ligament divided into two portions, and these were inserted into the superior extremities of the two divisions of the sesamoid bone, the outer division being in consequence the longer but was more slender.

On the accessory digit there was present a small but well-developed lateral ligament of the fetlock. This consisted of a slender band which passed from the outer side of the distal extremity of the external small metacarpal bone to the outer surface of the nodular part of the sesamoid bone, and another band arising in the same place and running downwards and backwards to be attached to the postero-superior angle of the first phalanx.

There was also present on the accessory digit a well-defined V-shaped division of the inferior sesamoidean ligament which ran from the base of the sesamoid bone to the back of the first phalanx, but there was no trace of the superficial division nor of the deep-crossed bundles of this ligament.

The Arteries.—The Large Metacarpal Artery (Fig. VII. 2).—A vessel of considerable calibre ran down the inner border of the tendon of the flexor perforans. Before arriving at the fetlock joint of the main digit the vessel dipped between the perforans tendon and the inner main divisions of the suspensory ligament. In the angle of bifurcation of this ligament, the vessel split into two digital arteries.

The Internal Digital Artery (Fig. VII. 16).—This made its appearance superficially on the inner aspect of the limb between the perforans tendon and the inner branch of the larger of the main divisions of the suspensory ligament. It then took the usual course to the inner aspect of the lateral cartilage, where it divided into plantar and preplantar vessels.

The External Digital Artery (Fig. VII. 8).—This passed downwards and outwards between the perforans tendon of the main digit and the vertical band of the inner division of the suspensory ligament. After a length of about an inch this vessel divided, the inner portion being continued as the outer digital artery of the main digit (Fig. VII. 15). Near the first interphalangeal joint it gave off a branch which passed on to the inner surface of the accessory digit, to the terminal portion of which it was distributed.

The other division of the external digital artery (Fig. VII. 9) passed transversely outwards almost at right angles to the parent

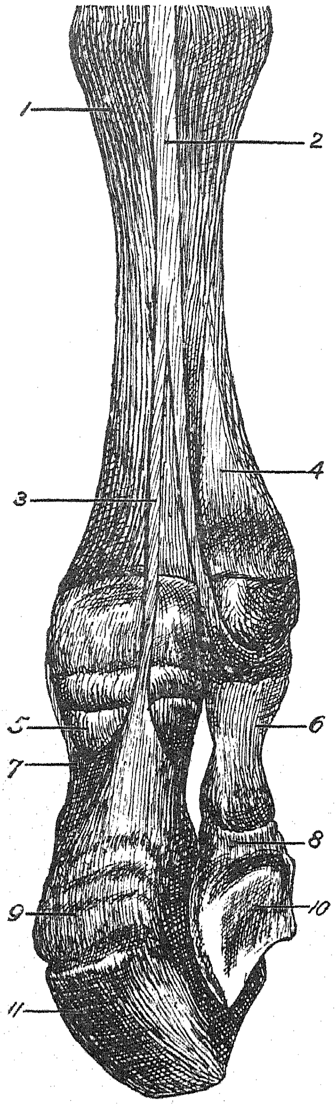


Fig. VI.

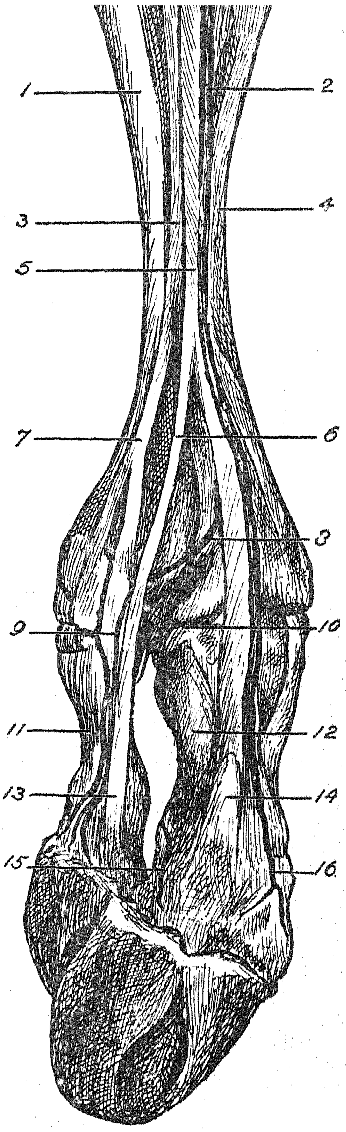


Fig. VII.

Case III.

Fig. VI.—1, large metacarpal bone; 2, tendon of anterior extensor (extensor pedis); 3, division of anterior extensor to principal digit; 4, outer small metacarpal bone; 5 and 9, first and second phalanges of principal digit; 6 and 8, ditto of accessory digit; 7, branch of suspensory ligament; 10, hoof of accessory digit; 11, hoof of principal digit.

Fig. VII.—1, outer small metacarpal bone; 2, large metacarpal artery; 3, suspensory ligament; 4, inner small metacarpal bone; 5, tendon of flexor perforatus; 6, division of same to the accessory digit; 7, branch of the suspensory ligament to the accessory digit; 8, external digital artery; 9, outer digital artery of accessory digit; 10 and 15, outer digital artery of main digit; 11, first phalanx of accessory digit; 12, ditto of main digit; 13, division of tendon of flexor perforatus to accessory digit; 14, ditto to main digit; 16, internal digital artery of the main digit.

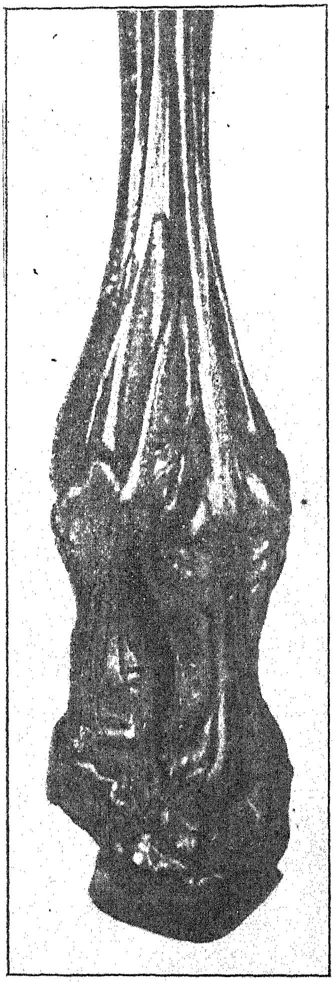
vessel, and running beneath the flexor tendons of the accessory digit gained the outer border of the corresponding portion of the tendon of the flexor perforans. The vessel followed the edge of this tendon to the inferior third of the first phalanx. Here it split into two portions, one of which was distributed to the front and outer lateral aspect of the terminal portion of the digit, whilst the other division, which was the larger, followed the posterior face of the perforans tendon, after the latter had emerged from the ring formed by the flexor perforans, and was finally distributed to the outer half of the extremity.

The Bones.—The inner small metacarpal bone (Fig. VII. 4) presented the usual features, excepting that it was very ill-developed. The large metacarpal bone was narrower in its inferior half, and the lower third of its outer border was flat and roughened for the attachment of the outer small metacarpal.

The Outer Small Metacarpal (Fig VII. 1).—This presented several peculiarities, since it carried the accessory digit. Its length was only an inch shorter than that of the large metacarpal. The whole bone presented a somewhat spiral appearance, the shaft being twisted in its length. Its superior extremity was much larger than that of the inner small metacarpal. Its shaft presented three surfaces. The inner, in its superior half, was flattened, and bounded the channel for the accommodation of the great suspensory ligament. The anterior surface was more or less flattened and firmly attached to the large metacarpal bone. In its lower third it faced directly inwards. The outer surface was concave in its length and convex in the transverse direction. Owing to the twisting of the bone, the inferior third of this surface looked forwards, and this portion was blended with the inner surface, the border separating the two surfaces being here smooth and rounded off. The lower extremity of the bone was much more massive than the upper. Inferiorly it was articulated to the superior surface of the first phalanx, and it presented four other surfaces, namely, an inner which was articulated to the outer surface of the distal epiphysis of the large metacarpal bone, a posterior which was articulated to the front of the sesamoid bone, and anterior and external surfaces which were blended and roughened for ligamentous attachment. The distal epiphysis of this small metacarpal bone ossified from a centre distinct from the shaft, the line of division between diaphysis and epiphysis

being still clearly indicated by a well-marked groove which encircled the bone.

The remaining bones of the large digit presented normal characters, with the exception of the terminal phalanx, the appear-



Case III.

Fig. VIII.—Posterior aspect.

ance of which was much distorted. It was articulated to the second phalanx in such manner as to form a lateral angle externally, so that in addition to the sole part of the internal portion of the wall at the back also came into a position with the ground.

One *sesamoid bone* was present on the supernumerary digit. This was of most peculiar shape and consisted of outer and inner portions, the latter being very much the larger. The outer portion was more compressed from before to behind and elongated from above downwards. The superior border extended to a much higher level than did that of the outer portion. As already stated, divisions of the suspensory ligament were attached to their upper borders. The sesamoid bone was further held in position by a band which passed from its inferior border to the back of the upper extremity of the first phalanx. The bone was encircled by a groove and the two portions developed from separate nuclei.

The *first phalanx* was slightly more compressed from side to side. The inner surface was concave in order that the concavity might accommodate the broad upper extremity of the first phalanx of the main digit, otherwise the bone presented the ordinary characters, excepting that the V-shaped roughened area on the posterior surface was very faintly marked.

This case is evidently a member of the simple Polydactyles. It is extremely interesting, however, inasmuch as it seems to represent a possible transition stage between a typical member of this class and one of the Schistodactyles. Evidence in support of this is found in the following points:—

(1) The diminished size of the internal small metacarpal bone —it appeared to be gradually blending with the large metacarpal.

(2) The size of the external small metacarpal.

(3) The form and position of its inferior extremity. A reference to Fig. VI. will show that this end has forced itself alongside that of the main digit.

(4) The blending of the upper end of this small metacarpal with the large.

(5) The tendency to a symmetrical conformation in the small digit, including the hoof.

CASE IV.*

This is the pes of an ox, showing a most perfectly formed supernumerary digit.

In this case, however, as a glance at Fig. IX. will show, the

*From the *Journal of Comparative Pathology*, vol. xv, pp. 143-146. (By kind permission of the Editor, J. S. J.)

abnormal digit, in addition to being to a certain extent weight-bearing, which is in itself somewhat remarkable, is most symmetrical in outline, and is developed to a degree which is almost on an equality with the normal ones.

The principal points of interest brought to light by the dissection of the pes were the following:—

Muscles.—Just above the fetlock the extensor proper of the middle digit gives off a branch which is continued downwards over the anterior aspect of the abnormal digit. When about the middle of the os suffraginis, this branch divides (Fig. IX. B), but a little lower down these sub-divisions reunite, and there thus seems to have been an arrest in the progress of development, and a tendency, as it were, to revert to the prevailing type. Lower down, however, the reunited tendon again divides, and we have an arrangement comparable to that found in the normal case, namely:—

(1) An external division, which may be said to correspond with the extensor proper of a normal digit, and which in turn divides into:—

(*a*) A thick cord-like tendon, which is continued downwards and becomes inserted into the anterior face of the second phalanx.

(*b*) An expanded sheet-like portion which becomes inserted into the side of the pedal bone. This flattened portion receives the branch of the suspensory ligament, which in Fig. X. A is seen to pass round the external lateral aspect of the accessory digit.

(2) An internal division (Fig. IX. B) thick in front, but flattened posteriorly and becoming inserted into the pyramidal process of the pedal bone. This division may be said to represent one of the branches of the common extensor of the two normal digits. The above-mentioned branch of the suspensory ligament has the usual arrangement, being given off from the more deeply seated of the two main branches into which the ligament divides. In Fig. X. it is also distinctly seen that the more superficial of the two main divisions of the suspensory gives off a branch which descends almost vertically to the back of the fetlock, where it assists the perforatus tendon in forming the ring through which the tendon of the perforans passes. In the same illustration the perforans tendon is also seen entering the ring, and lower down

it is again visible after passing through the little fibrous band below the fetlock.

A posterior view of the specimen is given in Fig. X., and in it the three divisions of both perforatus and perforans are observed to be almost equal in size (the perforatus tendon has been slightly pushed aside above the fetlock to bring the perforans into view). Another point which is here worthy of notice is the extremely well-developed band through which the perforans passes below the fetlock.

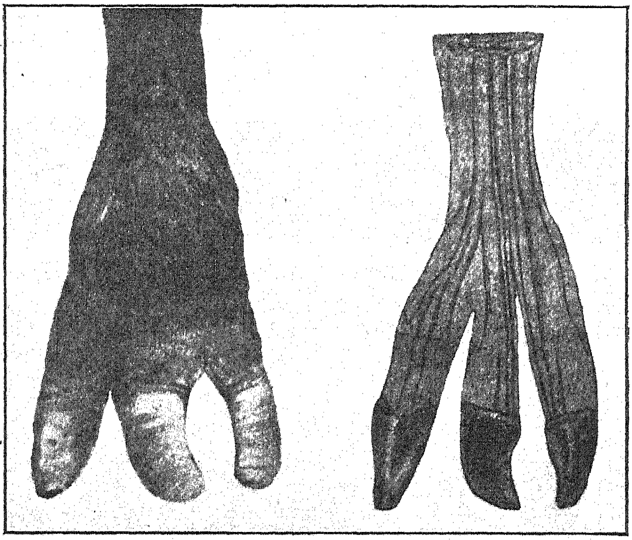


FIG. IX. A. FIG. IX. B.

CASE IV.

FIG. IX. A.—Anterior aspect with skin on. FIG. IX. B.—Anterior aspect with skin removed, showing tendons. (From *Journal of Comparative Pathology*, vol. xv.)

The Bones.—The posterior surface of the large metatarsal is flattened, and gradually widens out at its lower extremity, which is about double the width of the upper. Near the latter extremity this surface shows two foramina which are the inferior openings of canals leading from the upper articular surface. Two faint grooves traverse the length of the bone and terminate inferiorly, one in a foramen which is the posterior opening of a canal conducting to the anterior surface, the other in a cleft about an inch in length, which also passes through the bone. The inferior

extremity presents three pulley-like articular surfaces, the abnormal one differing from the other two in possessing an antero-posterior ridge which divides it into two areas almost equal in size and upon the same level.

There are five sesamoids, the accessory digit having only one. This one, however, is peculiar inasmuch as it seems to suggest that the digit at one time possessed two, for in appearance it very much resembles two sesamoids which have become fused together. Anteriorly it has four facets, the two central ones

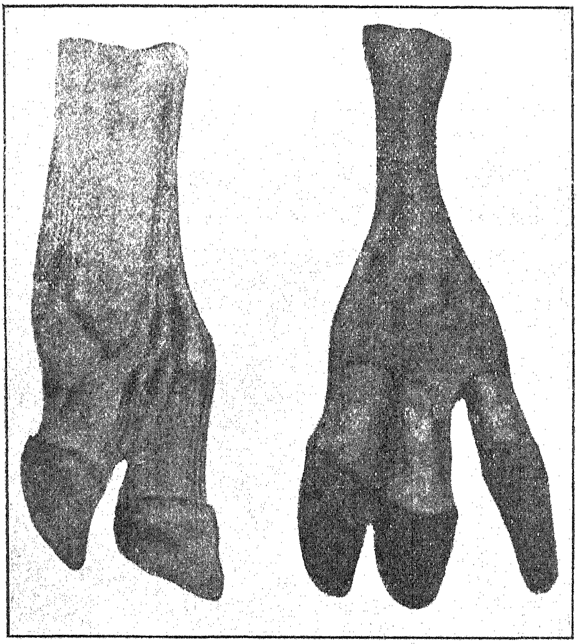


FIG. X. A. FIG. X. B.

CASE IV.

FIG. X. A.—Lateral aspect. FIG. X. B.—Posterior aspect. (From *Journal of Comparative Pathology*, vol xv.)

being for articulation with the ridge and the other two for articulation with the remainder of the pulley-like inferior extremity of the large metatarsal. Inferiorly it articulates with the os suffraginis by two facets which are separated by a non-articular depressed area, and posteriorly it is divided by a vertical groove into two markedly convex areas. It is thus entirely encircled by

a constriction which may possibly indicate the line of fusion of two originally distinct bones. The supernumerary first phalanx in shape more nearly approaches that of the horse, whilst the upper extremity of the second phalanx has a much more extensive articular area than the corresponding normal bone, and is devoid of the small upward projecting peak-like process found in the latter. The two buttress-like processes which posteriorly bound the upper articular surface of the os coronæ differ from the normal in being almost equal in height, and the recurved non-articular area which encroaches on the posterior surface is much smaller.

The articular area at the inferior extremity is much less extensive, but the antero-posterior groove is very well marked, being much deeper than those found in the corresponding bones of the other two digits.

Three navicular and pedal bones are present. The additional navicular is smaller than normal, but is very well formed and possesses facets for articulation with the os coronæ and pedal bone. The abnormal pedal bone is quite equal to the other two in size, but is slightly different in shape, being more compressed from side to side. The preplantar grooves on the external and internal laminal surfaces are much more distinctly marked. The solar surface is quite flat and in form resembles an elongated isosceles triangle with the apex at the toe. The general appearance of this bone much more closely resembled the corresponding bone of the horse, and a point of great interest is the still stronger resemblance which it bears to the terminal phalanx of the central digit in Case V.

Clinical Articles.

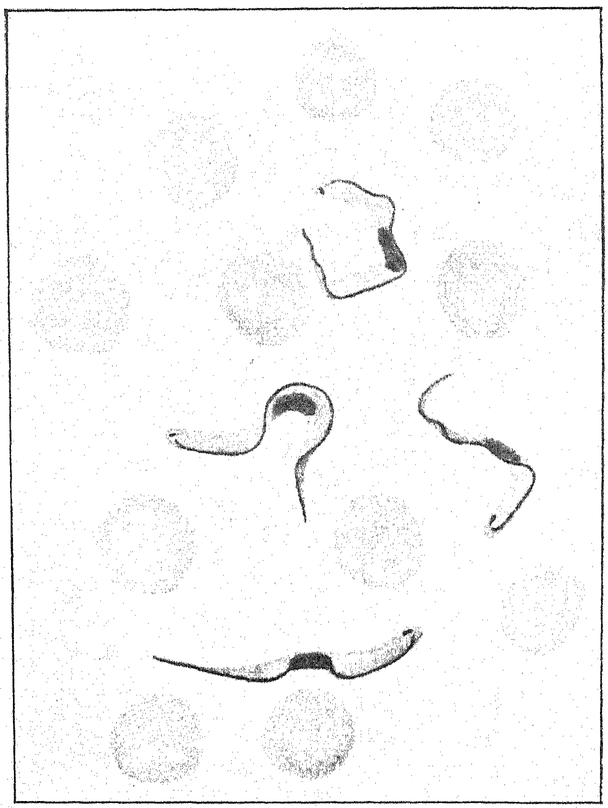
HORSE TRYPANOSOMIASIS OF ZANZIBAR.

By J. A. N. DA CUNHA, G.B.V.C.

Veterinary Officer to the Government of H. H. the Sultan of Zanzibar.

THERE can be no doubt that cases of trypanosomiasis are not of a very common occurrence in Zanzibar.

It was in February, 1908, that Dr. A. Edington, at that time bacteriologist to the Zanzibar Government, recorded an interesting



× 2,800. A composite field.
The drawings show the type of trypanosomes.

horse trypanosome which he described as "of a size somewhat like that of a trypanosome dimorphon but rather more delicate, and the

blunt end frequently tapered to an abrupt point which was somewhat characteristic."

Repeated efforts made by the writer throughout the island on various subsequent occasions have so far resulted in the discovery of a second case in a grey Australian gelding, aged 13, with the following symptoms : Intermittent fever (with alternate paroxysms of a short and irregular duration), membranes pallid, swelling of hind limbs, sheath and floor of the abdomen. Greedy appetite, enormous thirst, profuse urine, great loss of strength and condition.

Upon the evidence of this type of fever, very characteristic of the disease, blood smears were examined microscopically and the presence of trypanosomes demonstrated.

Facts regarding the existence of blood-sucking flies in different parts of this island go to prove that with the exception of five varieties known as the tabanus, stomoxys, hippobosca, chrysops and hæmatopata, no other species of any special interest have yet been seen.

[We are indebted to Mr. A. L. Sheather, M.R.C.V.S., B.Sc., for the drawings of the trypanosomes from slides forwarded to us by Mr. da Cunha. The trypanosomes were taken from several fields, and were drawn by the aid of the camera lucida × 2,800.—Eds. *V. J.*]

CHOKING TREATED SUCCESSFULLY WITH CHLOROFORM.

By W. LOTHIAN, M.R.C.V.S.

Duns, Berwickshire.

On May 1, I was asked to see a year-old stirk in poor condition, which had been ill two days, and which was suspected of being choked with a piece of turnip. On examination the obstruction could be felt in the gullet half-way down the neck. The probang was used, but with no effect; it (the obstruction) was firmly lodged and could not be moved on. Two or three more attempts were made, but failed. I now administered chloroform, which I had taken with me, after being informed it had been ill from the Saturday to the Monday. As soon as the animal was fairly well under I passed the probang, this time with success, the spasm seemed to be well relaxed and there was

little difficulty in getting the piece of turnip forced down the œsophagus.

This is the second case I have used chloroform for choking. The first time being in a quey. The first day I saw it I failed to get the obstruction, which was a piece of turnip, removed by means of the probang. I went back next day, tried probang again with no better result. It then occurred to me to try chloroform and see if it had any effect in removing the spasm of the gullet. After the animal was completely under its influence I passed the probang and the obstruction was removed with perfect ease, the weight of the probang carrying it away with little or no effort.

It appears from these two cases that chloroform would be well worth a trial in cases where other means had failed before performing œsophagotomy or where the obstruction was in the thoracic portion of the œsophagus.

TWO CASES OF EQUINE TUBERCULOSIS (MOTHER AND DAUGHTER).

By J. A. GILRUTH, D.V.Sc., M.R.C.V.S., F.R.S.E.

Professor of Veterinary Pathology, Melbourne University Veterinary School.

Two interesting cases of equine tuberculosis, probably the first observed in Australia, occurred in the practice of Mr. W. A. Kendall, G.M.V.C., and the relationship of the affected animals as well as the possible source of the infection being interesting, the cases are worthy of record.

The following is the history as kindly supplied to me by Mr. Kendall:—

"While at a farm at Elwood, attending to another case, my opinion was asked regarding a brown pony mare, aged about nine years, which, the owner informed me, had been gradually wasting away for some months.

While approaching the mare in the paddock, I noticed she was standing in a peculiar manner; the body being huddled up, and the off-foreleg advanced and slightly bent at the knee and fetlock.

On remarking about this to the owner, I was informed that the mare was not lame and could trot fairly freely; but while resting or grazing this limb was always placed in this peculiar manner.

On examination the general symptoms were those of some chronic generalized disease, and after examining the udder and lymphatic glands, I was led to suspect generalized tuberculosis.

While making further inquiries regarding the history of this animal, the owner informed me that he had hand-reared her as a foal on cow's milk, and that the cow, from which the milk was obtained, was not "a good doer."

I suggested applying the tuberculin test, but the owner would not agree to this course, and stated that he would try good nourishing food and tonic treatment for a month and if there was no improvement in that time he would destroy the animal.

About six weeks later I received a telephone message informing me that the mare had been destroyed and was being taken to the boiling-down works.

I telephoned to the works and asked the proprietor to save any specimens and send them along.

Next day I received a spleen which was very much enlarged and covered with numerous irregular pale coloured areas, which, on section, were seen to contain a varying quantity of caseous matter.

I forwarded the whole specimen to Professor Gilruth, who kindly reported that the case was one of tuberculosis.

I reported the result of the examinations, &c., to the owner, who then asked me to examine another mare, which, I was informed, was a daughter of the other case I had examined.

The owner had noticed she was falling away in condition and was showing the peculiar way of holding the off-foreleg.

This mare, if anything, showed more characteristic symptoms; great emaciation and weakness; diarrhœa and chronic pulmonary lesions.

On careful examination of the thoracic cavity by percussion and auscultation, a large quantity of fluid could be detected, the dull area extending well above the inferior third of the cavity; the pulmonary sounds were dull, and, towards the posterior extremities of the lungs, were entirely absent.

The udder was abnormal in size and very firm, with the

characteristic nodular condition. At the anterior border a large ulcer or cavity containing caseous matter was detected.

The retro-pharyngeal lymphatic glands were enlarged; but there was no characteristic cough.

I had no hesitation, after my previous experience, in diagnosing generalized tuberculosis in this case and recommended immediate destruction.

The animal was destroyed and the carcase removed to the most convenient place for a *post-mortem* examination, which, by Professor Gilruth's special wish, was carried out under his personal supervision.

In recording the above cases I wish to draw attention to the peculiar manner of holding the off foreleg; unfortunately I cannot describe this peculiar symptom in a more elaborate manner: it seems to have been a characteristic symptom in these cases, because the owner practically diagnosed the second case, after hearing the result of the microscopical examination of the spleen from the first case, from this symptom alone.

With the exception of the absence of a cough, the other symptoms shown were similar to those in a case of generalized tuberculosis in the ox."

The spleen of the first case was seen to be enormously enlarged, the centre being composed of a large irregularly spherical fairly dense mass about 5 in. in diameter, which on section showed numerous small degenerated caseous areas above the size of a pin-head scattered throughout. In the more normal substance of the spleen were numbers of smaller tumours varying from the size of a small pea to an orange, but these showed little and often no caseation. The lymphatic glands bordering the organ were enlarged and showed many small miliary tubercular-looking areas.

Smears of the caseous material examined microscopically demonstrated cocci and bacilli of various kinds, and when stained by Zeihl's method numbers of acid-fast bacilli morphologically characteristic of tubercle bacilli were seen lying both within and without cells.

Sections of the new splenic growths showed the typical histology of tubercular tissue with large numbers of giant cells and many tubercle bacilli, vacuolated and more like human tubercle bacilli than bovine.

On the second case we were able to make a hurried, though

fairly complete, *post-mortem* examination, the following being the notes:—

Filly pony, five years old. Body emaciated.

Post-mortem examination was made about four hours after death. Unfortunately for a variety of reasons time and situation did not permit of as complete and exhaustive an examination as could have been desired, yet an extremely interesting picture was presented.

The Udder.—Much larger than the normal non-lactating organ and firm in consistency. On section it was fibrous and infiltrated with caseous areas varying from the size of a pin-head to a small pea. The lymph glands on each side were enlarged, firm and somewhat nodular in appearance, and on section semi-caseous areas of varying size were found throughout the substance.

The Abdominal Cavity contained a very large quantity (estimated at 3—4 gallons) of straw-coloured effusion. The peritoneum was covered with small tubercles varying in size from a pin's-head upwards, the portion covering the diaphragm being thickly studded. The omenta and the mesentery showed a characteristic tubercular deposit, the tubercles being generally the size of a split pea. The serous coverings of the stomach and intestines, and all abdominal organs, also showed tubercular granulations, irregular in shape and distribution, some being distinctly pedunculated, and adhesions between folds of the intestines and between intestines and viscera were common.

Spleen.—Enormously enlarged, weighing 12 lb. Several large circumscribed abscesses containing caseo-purulent material, from a walnut to orange size were found situated, especially near the borders. Throughout the organ were numerous smaller tubercles, varying in size from a pin-head to a small pea, while a few others were the size of a marble.

Liver.—Greatly enlarged; weight, 35 lb. Dense and fibrous in consistence. On section the whole substance was seen to present a mottled appearance, owing to the enormous numbers of miliary tubercles scattered throughout the whole organ, apparently affecting each hepatic lobule.

Kidneys.—Beyond the serous covering being markedly tubercular appeared normal. The capsule stripped easily, the substance was pale on section, with here and there a small hæmorrhage.

Uterus normal so far as the mucous surface and wall were concerned.

Stomach and Intestines normal.

The Posterior Aorta was surrounded anteriorly by tubercular liver, and backwards as far as the bifurcation by masses of tubercular tissue which had their origin in the enormously enlarged sublumbar lymph glands. The whole of the vessel wall was more or less infiltrated with tubercular tissue, and its internal surface showed numerous nodules projecting into the lumen, though none were eroded.

All the lymphatic glands of the abdomen were greatly enlarged and studded with tubercular caseous foci varying in size.

The Thorax contained about 1½ gallons of straw-coloured effusion. The pleura was thickly covered with small tubercular nodules.

The Lungs were intensely infiltrated with very small miliary tubercles, the whole tissue on section presenting the appearance of a pinkish surface covered with greyish granules as of ground rice. The postero-superior portions of each lung were most severely affected, the new tissue having so completely obliterated the alveoli that pieces sank on being placed in water. Scattered irregularly throughout the lungs in addition to the minute tubercles were larger caseous masses about the size of a pea.

The Pericardium contained about 10 oz. of straw-coloured fluid. The epicardium at the region of the auriculo-ventricular groove was distinctly roughened and hyperæmic, as if in the earlier stage of tubercular invasion. The heart otherwise, beyond being pale, was not abnormal.

The whole of the lymph glands of the thorax were extensively invaded and greatly enlarged. The bronchial and anterior thoracic group formed a large dense mass, while the mediastinal glands were enormously enlarged. The superior and inferior thoracic chains were distinctly visible, each gland being the size of an almond. The submaxillary and pharyngeal glands were affected with tubercular areas.

Practically every lymphatic gland of the body was affected with tuberculosis. In no case was the whole of the gland caseous as in cattle, the caseous material being circumscribed by new fibrous tissue of but little density. In no instance was calcareous material encountered, and the pus was greyish and never firm in consistency.

Microscopical Examinations of pus from the udder, spleen, lungs, and all caseous areas showed masses of tubercle bacilli. The bacilli are long, thin and generally vacuolated. In the caseous material, particularly from the spleen, they seem to compose the whole of the substance, no cell elements and but little granular material being evident, smears having the appearance of pure cultures.

The evidence, which points strongly to infection of the filly with bovine tubercle bacilli directly from milk, and this is supported by the ready growth of the bacilli on ox-bile potato, and by the other cultural characters.

FRACTURED VERTEBRÆ—A CORRECTION.

IN Captain Nicholas's case, reported in the VETERINARY JOURNAL of last month on pages 283-4, the time of death should read 5 a.m., not 5 p.m.

Canine Clinical Note.

THE TREATMENT OF FOLLICULAR MANGE WITH ETHYL-CHLORIDE.

By J. B. BUXTON, M.R.C.V.S., D.V.H.
Barent.

READING a short time ago an account of the treatment of follicular mange in the dog with ozone and electricity I wondered if many members of the profession had tried ethyl-chloride as a curative agent, and if so with what results. In some cases I have found it to answer very well, and the following notes may be of interest to those who have not yet tried it.

Case I.—An Irish Terrier dog, 10 months old, was brought to me in August, 1910, showing typical lesions of follicular mange, the parts affected being the lips, nose, top of head, and along the back. The skin was thickened and there was a crust over the affected areas, those along the back being more or less circumscribed and covered by the overhanging neighbouring hair. The material from the pustules on microscopical examination showed the demodex in large quantities in each lesion. The parts were thoroughly cleansed and dried and the surrounding hair removed. The ethyl-chloride

was then sprayed on slowly until the skin was insensitive to the prick of a needle, and the application continued for about a minute, care being taken not to freeze the skin too hard in case of subsequent necrosis. In the case of each of the areas, with the exception of one lip, a second application was not necessary, and healing of the parts was rapid, the treatment consisting of the application of antiseptic powder as for an open wound. The hair was slow in growing, and then very thin, while one small area on the back remained nude. A laxative diet was given and tonics were used. The animal seen three months later appeared to be quite recovered.

Case II.—An Irish terrier dog, litter brother to the above, was treated at the same time and in the same manner, but recovery was slower owing to the fact that the whole chest was affected besides the head, nose, paws, and inside of fore limbs. A small area inside the left fore limb became necrotic owing to the skin having been frozen too severely, but the ultimate recovery was excellent.

Case III.—A bull-terrier bitch, 6 months old, was brought to me in April of this year in a very advanced state of follicular mange. The whole of the chest and throat, besides the head, lips, eyelids, and inner surface of all four limbs and paws were affected. The skin was thickened and riddled with holes as though it had received a charge of small shot, while there was the usual yellow crust on the removal of which pus exuded. The demodex was demonstrated on microscopical examination. The animal was in an extremely emaciated condition and very weak. After changing and drying the parts the ethyl-chloride was applied, but, unfortunately, the animal died the fourth day after admittance.

Case IV.—An Airedale bitch, 12 months old, was brought to me May 3 suffering from follicular mange, the demodex being found in the pus. The lesions were not extensive, and were confined to the chest and paws. The treatment was the same as for the above, but the paws required a third application; the result, however, was satisfactory and recovery seems complete.

It would be interesting to know what success other practitioners have had with this treatment, as it seemed to me very effective, the only drawback to it apparently being the care necessary in its application and the risk of subsequent necrosis.

Abstracts.

THE BACTERIOLOGY OF COMMERCIALLY PASTEURIZED AND RAW MARKET MILK.*

By S. H. AYERS and W. T. JOHNSON.

PASTEURIZATION is a term which needs no explanation, nor is it necessary to review its history. The general public has been liberally informed during the past two years as to what the pasteurization of milk means. It is true that newspaper articles often are misleading, and the minds of the people have been led to favour or oppose pasteurization largely through popular articles in the press or advertisements of dairies, which either point out the value of or the danger from pasteurized milk.

But the question as to pasteurization is not unsettled in the public mind alone; the subject is one which has caused a division of opinion also in the medical profession and in the scientific world. There are those who oppose pasteurization and those who are in favour of it. Some oppose it under any condition; others admit that it should be resorted to under exceptional conditions.

It may be asked with fairness why such a division of opinion exists among even those who have made milk problems a life study. Only one answer can be given, namely, that the subject of pasteurization has as yet been touched only upon the surface, notwithstanding the numerous valuable pieces of research work which have been published concerning it.

MODERN THEORIES OF PASTEURIZATION.

Since the pasteurization of milk has become extensively practised and is advocated by health officers and other authorities on milk, obviously there must be some advantages connected with the process. Some of the points of value in pasteurization which serve as a foundation for the opinions of those who advocate the process may be considered first.

Advantages Claimed for the Process.—When the *rôle* that raw milk plays as a vehicle of disease and the ease with which it may become infected are considered, obviously the principal advantage of pasteurization is in the destruction of pathogenic organisms. It has been shown by many investigators that *Bacillus tuberculosis*, *B. typhi*, *B. diphtheriæ*, and the dysentery bacillus are destroyed when milk is pasteurized at 60° C. (140° F.) for twenty minutes. While epidemics caused by infected milk may occur only at rare intervals, any possible means of protection seems justifiable. Sanitary inspection has greatly improved the milk supply, but under present conditions its scope is limited by the magnitude of the problem. The aim of sanitary supervision is to improve the

* Abstract from Bulletin 126, Bureau of Animal Industry.

conditions under which milk is produced. The goal of the struggle for improved milk is the production of clean milk from tuberculin-tested herds, preferably produced by a few large dairy farms which are under the supervision of competent men, rather than on a large number of small farms. Granting, however, that ideal conditions can be ultimately reached, we are nevertheless confronted by entirely different conditions at the present time. Certified milk is produced in relatively small amounts in this country, and its cost of production makes its price prohibitive for a large majority of people. A good grade of clean milk may be furnished to a city where the consumption of milk is small enough to allow constant inspection of the dairy farms supplying the city. With large cities the problem is different. For example, take the case of New York, where the milk supply comes from approximately 35,000 farms located in six different States and is shipped from about 700 dairies. With milk coming from such a large area, constant sanitary supervision is an immense problem. In such a case the general conditions on the farms may be improved, but to expect in the immediate future to have all the milk come from tuberculin-tested cows and to have inspection of the farms efficient enough to prevent the possibility of typhoid infection is beyond reason.

The frequency of tubercle bacilli in market milk is well known. Anderson in an examination of market milk in Washington, D. C., has shown that milk from approximately 11 per cent. of the dairies examined contained tubercle bacilli virulent for guinea-pigs. Examinations even of certified milk sometimes show the presence of the tubercle bacillus.

The number of epidemics of typhoid fever traced to milk is striking. Schüder collected from the literature statistics of 650 typhoid epidemics, the supposed cause of which had been reported. Of these 462 were reported as spread by water, 110 by milk, and 78 by other agents. Lumsden gives figures showing the theoretical number of typhoid cases in Washington during one year which may be expected to be caused by infected milk. According to his figures 1,000 farms supply Washington, and by estimating seven persons living at each farm and considering that in the United States every year about one in every 300 persons has typhoid fever, then some 25 cases per year may be expected to occur on dairy farms supplying the city.

It is easy to see how typhoid on farms may be readily conveyed by means of milk to the city, where epidemics may result. Even with sanitary supervision of the farms it is hard and practically impossible to prevent occasional infection of the milk. Frequently cases of typhoid fever are not recognized up to the second or third week of illness, until which time no precautions are taken. In many instances mild cases are unattended by a physician and even in some cases may not be recognized. Persons who have recovered from the disease but who are still discharging typhoid bacilli in their stools and urine may directly infect the milk while handling it.

The *rôle* of typhoid carriers in the spread of the disease in

relation to the infection of milk is attracting attention. Albert has shown that about 75 per cent. of all carriers are women, and that, almost without exception, the carriers have been employed in some occupation, as baker, cook, or handler of milk, which has enabled them to transmit typhoid bacilli to substances used as food by others. He says that in some cases carriers had typhoid but a short time previous, and in other cases as long as ten, thirty, and even fifty-two years. He estimates that one in every 500 adults is a chronic carrier, while it has been estimated that there are about one-half as many carriers in a community as there are cases of typhoid fever. It is evident that to guard against chances of typhoid infection from an inspected dairy it may be necessary to have a medical examination of the dairymen.

Numerous cases of epidemics of diphtheria and scarlet fever, as well as more obscure diseases, have been traced to milk. In this connection Freeman states: "Diphtheria has apparently been spread by the best of our milk supplies. What protection have we against this in any raw milk? Virulent diphtheria bacilli exist in the throats of many healthy persons, and, though in our best dairies we have some medical supervision, no supervision could be practically enforced that would protect the milk from a beginning diphtheria or a healthy diphtheria bacillus carrier."

The numbers of bacteria in milk are of great importance in relation to intestinal diseases in children. The establishment of pasteurizing plants by Straus in various cities, where pasteurized milk is supplied to children of the poor, who are ordinarily compelled to use a dirty milk high in bacteria, as well as the use of commercially pasteurized milk, has done much to lower the infantile death rate. It seems to be the number of bacteria rather than the species which are concerned. Park says: "After five years of effort to discover some relation between special varieties of bacteria found in milk and the health of children the conclusion has been reached that neither through animal tests nor the isolation from the milk of sick infants have we been able to establish such a relation.

Kenwood believes that the pasteurization of the public supply affords a readily available means of bringing about a reduction of infantile sickness, even if the maximum is conceded to those who discredit it. Lederle in stating the advantages of pasteurized milk states: "The great benefits derived from its use in infant feeding in hospitals, infant-milk depôts, and in private practice will be attested by most physicians."

The destruction of a large percentage of the bacteria during pasteurization results in an improved keeping quality, which is of importance from a commercial as well as a hygienic point of view.

The principal advantages of pasteurization may be summarized as follows:—

(1) Protection from infection with the diseases usually transmitted by milk.

(2) Reduction of bacteria and, as a consequence, of the infantile death rate.

(3) The enhancing of the keeping quality of the milk.

It might seem that the advantages of pasteurization mentioned in the preceding pages were of sufficient value to advocate its general application. Many authorities, however, do not favour pasteurization. Some of the objections may be considered next.

Objections to Pasteurization.—One of the most serious objections to pasteurized milk is that it is believed to putrefy rather than sour, due to the destruction of lactic-acid bacteria which produce acid in raw milk. The destruction of the acid bacteria is believed to result in the unhindered growth of undesired organisms which may form toxins or other poisonous products, thus making the milk unfit for human consumption, especially in the case of young infants. This view dates back to the investigations of Flügge, whose work on pasteurized milk heated to 70° C. (158° F.) for thirty minutes demonstrated the presence of spore-forming, peptonizing bacteria which developed in the milk and formed highly toxic substances. Weber, however, found only three of these types of bacteria during an examination of 150 samples of commercial sterilized milk. Farrington and Russell state that in numerous experiments they have found the thermal death point of the lactic-acid bacteria to be in the neighbourhood of 57.2 to 60° C. (135 to 140° F.) where the exposure was for ten minutes. Russell and Hastings state, in their book on Agricultural Bacteriology, that: "The lactic bacteria do not form spores, and hence are easily killed if milk is heated. If milk is pasteurized and subsequently kept free from lactic bacteria, it will not sour, but will putrefy, due to the development of the spores not killed by the heating. Often the first sign of spoiling in pasteurized milk is the appearance of a bitter or other undesirable taste. Frequently it does not curdle for a long time. One of the dangers in the use of pasteurized milk is the fact that the consumer has no way of telling how old it is. It may appear normal in every way and yet be harmful to the health."

Revis, in a discussion of a paper by Kenwood, makes the statement that raw milk never putrefies, pasteurized milk always does. Lederle believes that with the destruction of the ordinary lactic-acid bacteria, which constitute the danger signal of old milk, the souring process is interfered with, and that more serious changes may take place without the knowledge of the consumer. Freudenreich points out the danger of allowing pasteurized milk to stand at high temperatures, due to the growth of spores of the hay and potato bacillus which are not killed during pasteurization. Jensen considers that the use of temperatures suitable to kill *Bacillus tuberculosis* destroys also the lactic-acid bacteria, which, under normal conditions in raw milk, prevent undesirable fermentations. In consequence the commercially pasteurized milk becomes more dangerous than raw milk. He believes that the degree of acidity of raw milk indicates its freshness, while the most dangerous alterations in pasteurized milk often are not visible macroscopically and escape those who control its consumption.

Rickards states: "Pasteurized milk seems to keep longer, but eventually acquires a strong odour, and really may be said to

decompose rather than sour. In nearly every instance we found that pasteurized milk, even when heavily loaded with bacteria, did not decompose until after the non-pasteurized milk taken at the same time had curdled. That such milk is unfit for food, especially for babies, goes without saying.

In connection with this objection to pasteurization Dr. Harrington, in a discussion of a paper by Kotch, states: "Again, it will make possible the carrying along of milk until, although not sour, it may become more or less poisonous. I believe that dirty milk should be allowed to stay dirty, so that it will sour more quickly, rather than that the lactic-acid ferments shall be destroyed and the commercial life of the milk be prolonged, thus permitting those organisms which are not affected by heat and which are believed to elaborate toxic substances to go on making the milk dangerous."

Another objection to pasteurization is brought out by Pennington and McClintock, who ask this question: "When milk before pasteurization shows a count of over 1,000,000, is it desirable to permit in a food the toxins and products of metabolism of these many generations of organisms, even though they themselves may be reduced to a very few hundred thousand at the expense frequently of milk enzymes and probably other substances closely connected with its food value and keeping qualities?"

Rotch expresses the same sentiment when he says: "It is a fact that certain organisms are killed by pasteurization, but we cannot kill the toxins of these organisms by heat. Simply pasteurizing or sterilizing will still allow the milk to contain elements which are exceedingly dangerous to those who drink it, and especially where young infants are concerned."

Rotch further states that the improper methods of heating now in vogue preserve the milk only some five or six hours longer than the normal raw milk, and that the commercially pasteurized milk after it has turned sour seems to be in a great deal worse condition than when natural souring took place. It may be noted, however, that his views are based on clinical observations rather than experimental data.

Some object to pasteurized milk on account of the careless methods of handling after pasteurization. Pennington and McClintock believe that from the quantitative count alone it would scarcely seem worth while to pasteurize milk of fair quality, since the contamination acquired in bottling is very often sufficient to over-balance the original germ content of the milk. They found that in commercial pasteurizing plants very low counts could be obtained from milk in the heating coils but that it was contaminated in the cooling and bottling, so that sometimes the final count was higher than that of the original milk.

It is greatly feared by some that the adoption of pasteurization will interfere with the extension of sanitary supervision. This opinion is well expressed in the discussion of Rotch's paper by Harrington, who says: "Pasteurization will put back improvements on the source of the supply and will encourage dirty habits, the farmer understanding that it is not necessary to be so

particular since the dirt that gets in is going to be cooked and made harmless."

Another serious objection is that unscrupulous dealers may repasteurize their milk or pasteurize an old milk which ordinarily would not be marketable. It is safe to say, however, that such cases are exceptional. It is often stated also that bacteria increase more rapidly in pasteurized milk than in raw milk, and considering the possibility of infections as shown by Pennington and McClintock the more rapid growth presents a serious objection to pasteurized milk. St. John and Pennington have shown in a few experiments that a more rapid increase in bacterial growth takes place in pasteurized reinfected milk than in raw milk. Their conclusions are based on the ratio of increase. Rickards working on commercially pasteurized milk concludes that on the average bacteria will increase four times as fast in pasteurized milk as in raw milk when kept for twenty-four hours at the temperature of the ice box. His conclusions are drawn from the following table and are based on the ratio of bacterial increase:—

	Unpasteurized milk, average count.	Pasteurized milk, average count.	Number of samples.
First day	1,087,000 ...	44,000 ...	87
After 24 hours in ice box ...	22,617,000 ...	3,691,000 ...	...
Per cent increase	2,100 ...	8,400 ...	...
Ratio	1 ...	4 ...	...

The change in the chemical constituents of milk produced by heat is sometimes the basis of objection to pasteurized milk. Chemical investigations have shown that high temperatures do produce changes in the composition of milk, but the question of the action of lower temperatures for a long period of heating, such as is employed in the "holder" process, is one which demands further study.

As to the effect of feeding heated milk to children, here again authorities are divided. Some believe that malnutrition can often be attributed to the use of pasteurized milk and that rickets and scurvy result from its use. Most authorities, however, agree that pasteurized milk is not injurious, at least as far as the chemical changes produced by heating are concerned.

The objections to pasteurization which are generally accepted as being well founded may be summarized as follows:—

(1) It is believed that the lactic-acid bacteria in raw milk, which eventually sour the milk, exert a restraining influence on the peptonizing bacteria, which would otherwise cause the putrefaction of the milk. In other words, when milk is pasteurized and subsequently kept free from lactic-acid bacteria, which are easily killed by heat, it will not sour but will putrefy, due to the development of peptonizing bacteria, the spores of which are not destroyed during pasteurization. The peptonizing bacteria, when freed from the restraining influence of the lactic-acid organisms,

may increase to large numbers and produce toxins and poisonous decomposition products.

(2) The pasteurization of dirty milk, while reducing the bacterial numbers, does not destroy the toxins or other products of bacterial growth.

(3) Careless methods of handling after pasteurization may result in serious contamination of the milk.

(4) Pasteurization may be used simply to cover up dirty milk; it may encourage dirty methods in production and retard the extension of sanitary supervision.

(5) Milk which has not been sold may be pasteurized, or even repasteurized, and its faults hidden.

(6) Bacteria may increase more rapidly in pasteurized milk than in raw milk.

(7) Undesirable changes may be produced by heating which result in making the milk less digestible, particularly in the case of infants.

It will be seen from the foregoing that much is to be said on both sides of the question, and that further investigation is required, which must be sufficiently thorough and deep so that the conclusions arrived at may be generally accepted.

Object of this Investigation.

The general object of this work has been to study the bacterial flora of commercially pasteurized and raw market milk. The term "commercially pasteurized" signifies all kinds of such milk and is not intended to indicate the "flash" process, which is distinguished in some cities from perfectly pasteurized milk (meaning that pasteurized by the "holder" process). The endeavour has been made to study the bacteria in the two kinds of milk, pasteurized and raw, when fresh and on each succeeding day as long as the milk was fit for consumption. The special objects have been to determine to what extent the lactic-acid bacteria were destroyed, and to what extent the peptonizing bacteria developed, and to compare the development of various groups of bacteria in pasteurized and raw milk.

Summary and Conclusions.

The results in this paper hold only for commercially pasteurized milk. By commercial pasteurization is meant milk heated from 60° C. (140° F.) to 65.6° C. (150° F.) in the "holder" process, or up to 71.1° C. (160° F.) in the "flash" process. At the present time the tendency is to use low temperatures with the "holder" process, and in commercial work it is doubtful if temperatures will ever be used universally in either process higher than those above mentioned. When higher temperatures are used the cream line is liable to be destroyed, a cooked taste may be produced which injures the sale of the milk, and the cost of pasteurization is increased by the use of more steam. It is not reasonable, therefore, to expect the use of high temperatures in commercial pasteurization. Arbitrary limits could be set, as 60° C.

(140° F.) to 62.8° C. (145° F.) and even perhaps to 65.6° C. (150° F.) for the "holder" process and 71.1° C. (160° F.) to 73.9° C. (165° F.) for the "flash" process, at which temperatures milk when heated under commercial conditions may be expected eventually to sour, and the bacterial content will be comparable to the average group curves for pasteurized milk as shown in this paper. If higher temperatures are used a degree of heat may be reached which will result in the destruction of all but spores, which, when allowed to develop, will undoubtedly produce peptonization of the milk. Granting that 60° C. (140° F.) for twenty minutes is sufficient to destroy pathogenic organisms, it is believed it would nevertheless be advisable in commercial work to use a temperature a little higher, as 62.8° C. (145° F.) and for thirty minutes. That temperature would be sufficiently high to afford protection against pathogenic bacteria and yet would probably leave in the milk the maximum proportion of lactic-acid bacteria, and the group proportions would be very similar to those of all grades of market milk.

Conclusions.—(1) Commercially pasteurized milk always sours, because of the development of lactic-acid bacteria which on account of their high thermal death point survive pasteurization, and perhaps in some cases because of subsequent infection with acid-forming bacteria during cooling and bottling.

The acid development in an efficiently pasteurized milk is about the same as that in a clean raw milk. But sometimes a strong, old taste develops which is probably due to the development of alkali or inert bacteria. The old taste, however, is not characteristic of pasteurized milk, for it may be noticed as well in clean raw milk when held under similar conditions. The less efficient the pasteurizing process the more closely does the acid increase of the heated milk approach that of a dirty raw milk.

(2) The relative proportion of the groups of peptonizing, lactic acid, and alkali or inert bacteria is approximately the same in efficiently pasteurized milk as it is in clean raw milk. In both cases the alkali or inert forms constitute the largest group, the lactic-acid bacteria next, while the peptonizers are in the minority. When both of these milks—the efficiently pasteurized and clean raw milk—are held, the group relations change; but if the changes which take place are compared it will be found that they are the same in each. At the time of souring, the group proportions have changed so that the lactic-acid bacteria constitute the largest group with the alkali or inert forms next in order and the peptonizers in the smallest proportion as initially. In both of these milks the group of peptonizers may increase slightly in its proportion to the other two groups during the first two days, but it then gradually decreases and always forms the smallest group.

When milk is less efficiently pasteurized the position of the groups may be reversed so that the lactic-acid bacteria constitute the largest group with the alkali or inert forms next in order, but here again the peptonizers form the smallest proportion of the total bacteria. This group arrangement is the same in a dirty raw milk.

The more efficient the pasteurization, the smaller the percentage of lactic-acid bacteria; and, similarly, the cleaner the raw milk, the smaller the percentage of lactic-acid bacteria.

(3) The peptonizing bacteria are present in smaller numbers in the inferior grades of commercially pasteurized milk during the first twenty-four hours after receiving than in raw milk of the same quality, and the peptonizers may increase to slightly higher numbers in the pasteurized milk when held several days than in the raw milk of high initial lactic-acid bacteria content; but it should be remembered in this connection that milk is usually consumed within twenty-four hours after delivery. The number of peptonizers in a good grade of commercial pasteurized milk on the initial count and on succeeding days is approximately the same as in a clean raw milk when held under similar temperature conditions.

(4) Lactic-acid bacteria of high thermal death point are found in milk and may be easily isolated by special methods of procedure. From these experiments it was found that when milk is heated for thirty minutes at 60° C. (140° F.) and plated, the percentage of acid-forming organisms that resisted the heating ranged from 0.001 to 18.91, the average being 4.8 per cent. of the total acid colonies. When heated at 65.6° C. (150° F.) the range is from 0.001 to 3.13 per cent., the average being 0.74 per cent. of the total bacteria. It must be remembered that these figures are based upon acid colonies, and these are not necessarily all true lactic-acid bacteria.

The thermal death point of one lactic-acid organism which was isolated from milk is 74.4° C. (166° F.) in broth and 75.6° C. (168° F.) in milk when heated in Sternberg bulbs for thirty minutes. When heated for ten minutes in milk the thermal death point is 77.8° C. (172° F.).

These heat-resisting lactic-acid bacteria play an important part in pasteurized milk and undoubtedly account to a large extent for its ultimate souring.

(5) All milk, whether pasteurized or raw, must necessarily be infected during cooling and bottling by bacteria in the receiving tanks, in the pipes, on the cooler, and in the bottles; but the low bacterial counts obtained from pasteurized milk in these investigations show that the reinfection must have been very small.

(6) It is manifestly unfair to conclude that bacteria increase faster in pasteurized than in raw milk, simply from a comparison of the ratios of bacterial increase. If a pasteurized milk with a low initial count is compared with a raw milk of high bacterial content then the ratios of increase may show that the bacteria in the heated milk do increase faster; but if the same pasteurized milk is compared with a clean raw milk with a low count, then the ratios of increase will be found to be approximately the same. From the results of this investigation it is evident that bacterial increase in an efficiently pasteurized and a clean raw milk is about the same when the samples of milk are held under similar temperature conditions. This question of the relative growth of bacteria in raw and pasteurized milk can be properly settled only

by a long series of comparisons of samples of milk with approximately the same bacterial count and similar bacterial group percentages.

(7) The "holder" process of pasteurization is superior to the "flash" process. With the "holder" process a high efficiency may be obtained with a low temperature, while to obtain the same efficiency with the "flash" process a high temperature would be required. A temperature of 62.8° C. (145° F.) for thirty minutes seems best adapted for efficient pasteurization.

(8) Considering the low counts of bottled commercially pasteurized milk and the similarity of the bacterial group proportions to those of clean raw milk, the former cannot be classed from a bacteriological point of view as inferior to commercial raw milk. Pasteurized and raw milk should, however, always be bottled and should not be allowed to be sold as "loose" milk from stores.

(9) Pasteurization should always be under the control of competent men who understand the scientific side of the problem. It is believed that ignorance of fundamental bacteriological facts often accounts for inefficient results rather than a wilful lack of care on the part of the dairyman.

Reviews.

MORPHOLOGY OF THE VERMIFORM APPENDIX.

BY WALTER STAPLEY, M.D., D.V.SC., M.R.C.V.S., AND L. C. LEWIS, B.V.SC.

(*Proc. Roy. Soc. Vict.*, vol. xxiii, Pt. II, pp. 342-357.)

THIS paper, which is well illustrated, represents research work done in the anatomy department of the Melbourne University Veterinary School, and shows the importance of veterinary training in the comparative study of anatomical structure, even from the human point of view, filling as it does the gap between the work of the general biologist and the purely human anatomist.

The paper bears evidence of very careful examination of the digestive tract, particularly the large bowel of a large number of animals of widely different genera.

The statement by Chalmers Mitchell that the rabbit has a "vermiform" appendix is attacked and discredited, because although the free extremity has a narrow lumen due to the abundant lymphoid tissue present, the appendix, if it may be so termed, is not in appearance vermiform; and, further, because the authors deny that lymphoid tissue has any connection with the form of the human appendix.

As is well known, the original theory that the human appendix is vestigial in origin has been abandoned during recent years in many quarters, chiefly owing to the work of Ellenberger and of Berry, who consider it a development, a part "specialized for

lymphoid function and not a vestigial remnant" (Berry). S. and L. state, however, that "lymphoid tissue should be regarded from many points of view before it can be accepted as the cause of the appendix," for "a mass of round cells must assume the shape their containing tissues determine." In support of their opposition to the new theory and support of the old, they cite the cæcum of the cat, which has "as much or about as much lymphoid tissue" as the human appendix, and the pig's intestine, which has a Peyer's patch about 6 ft. long, neither of which masses have induced the formation of anything approaching an appendix, and especially the "Wombat," which has a true appendix, vermiform in shape, therefore analogous in every way to the human, with the important exception that it contains no more lymphoid tissue than is present elsewhere in the intestines of that marsupial.

As to the shape of the appendix in man and in the wombat, S. and L. consider this "depends on the muscular wall of the cæcum, the outstanding cause being the external longitudinal muscle coat, arranged in bands over what is regarded as the cæcum, and in a sheath or sac over that part of the cæcum which is called the vermiform appendix." This theory of causation is worked out in considerable detail, and which is illustrated by many photographs of different cæca, such as man, including Treves' four types of appendix, rabbit, cat, baboon, lemur, Tasmanian devil, koala, common wombat, and Flinder's Island wombat (for many years believed extinct), besides photomicrographs of sections of human appendix, kitten's cæcum, wombat's appendix, and wombat's cæcum.

The treatise bears evidence of very great work and clear reasoning, but we think it suffers greatly from an endeavour to compress the matter into too limited a space; indeed, it has apparently been penned more from the standpoint of a criticism of present-day beliefs, than the record of new and valuable observations, but that we hope may follow in more detail later on.

Miscellaneous.

ROYAL COLLEGE OF VETERINARY SURGEONS.

Fellowship Degree.

A meeting of the Board of Examiners for this Degree was held at the College, 10, Red Lion Square, W.C., on Saturday, May 13. The following is a list of the successful candidates, together with the title of their respective theses:

Mr. D. C. Matheson, "Notes on the Organ-Incidence of Neoplasmata in Domesticated Animals."

Mr. W. Jackson Young, "Anthrax."

Mr. A. W. Noel Pillers, "Some Seldom Recorded Parasitic Conditions."

Captain F. C. O'Rorke, "Rinderpest (Cattle Plague), especially as met with in India."

Mr. A. C. Duncan, "Immunity."
Mr. W. Hepburn, " Anthrax."
T. Eaton Jones, "The Control and Management of a Municipal Stud."
Mr. A. Walker, "Anthrax."

The Examiners were Messrs. J. Malcolm, W. Hunting, Professor Macqueen, Mr. Sidney Villar being in the chair.

FRED. BULLOCK, *Secretary.*

ROYAL COLLEGE OF VETERINARY SURGEONS.

EXAMINATIONS IN SCOTLAND.

At a meeting of the Board of Examiners held in Edinburgh and Glasgow on May 12 for the Written, and on May 16, 17 and 18 for the Oral and Practical Examinations—

Edinburgh College.

The following gentlemen passed their Final Examination :—

Mr. L. A. Auchterlonie
,, J. B. Isle
,, W. J. E. Mackenzie
,, P. B. Riley
,, W. Halstead
,, R. Wooff
Mr. D. A. Hosford
,, C. Masson
,, R. E. Murison
,, H. L. Torrance
,, W. D. Connochie

The following passed their Third Examination :—

Mr. A. J. R. Bott
,, W. Kearney
,, W. W. Peggie
Mr. S. Littler *
,, J. McAfee

The following passed their Second Examination :—

Mr. J. B. Russell
,, G. Atkinson *
,, J. W. Hayes
Mr. R. S. Little
,, D. Starkey

The following passed their First Examination :—

Mr. R. L. Creery
,, A. D. Sanderson
,, J. E. Syme *
,, R. E. Bond *
,, N. Brear
,, T. Dalling *
,, Mr. J. Hatrick
,, D. M. Ireland
,, G. C. Lancaster
Mr. D. Marshall *
,, T. M. Mitchell
,, J. J. Plunkett
,, R. Simpson
,, B. van der Vijver
,, P. W. Walker
,, R. J. Forrest
,, J. B. Mackie

Marked * passed with Second Class Honours.

Liverpool College.

The following gentleman passed his Final Examination :—

Mr. H. L. Sowerby

Glasgow College.

The following gentlemen passed their Final Examination :—

Mr. P. Meikle
,, J. Cunningham
Mr. H. M. Johnston

The following passed their Third Examination :—

Mr. R. M. Lawson
,, A. S. Ferguson
,, J. L. Taylor
Mr. T. Menzies *
,, D. Keir †

The following passed their Second Examination :—

Mr. E. F. Angler
,, Mr. J. M. Dawson
Mr. T. T. Taylor
,, Q. A. Stewart

The following passed their First Examination :—

Mr. E. E. McLachlan *
,, W. Watt
Mr. T. M. Timoney

Marked thus † passed with First Class Honours.
Marked thus * passed with Second Class Honours.

Dublin College.

The following passed their Third Examination :—

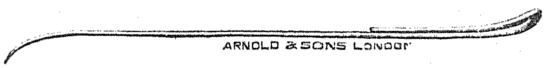
Mr. T. H. Kellett
Mr. R. Burris

New Instruments.

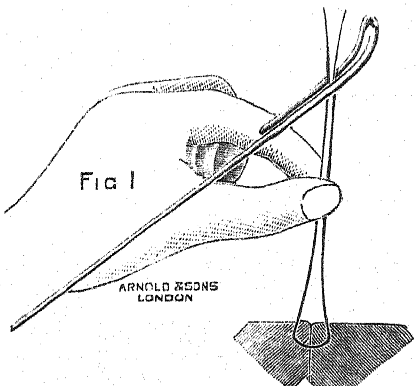
MEADOWS' SUTURE AND LIGATURE KNOTTER. PATENT 1396/10.

BY D. MEADOWS, M.R.C.V.S.

THIS instrument is specially designed for the purpose of knotting sutures and ligatures in positions difficult or impossible to reach with the unaided hand. It also does away with tangling



amongst the ends of a series of sutures during tying. It can also be used as a blunt or sharp probe, a director, or a ligature carrier. The knot tied is absolutely secure, and is the smallest and neatest

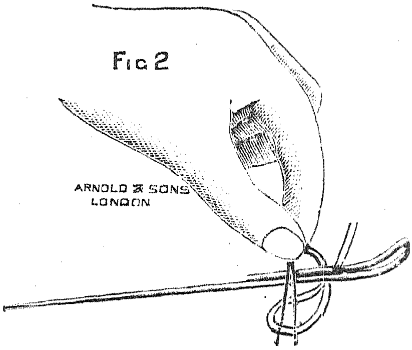


possible and cannot slip loose during the process of tying (as often happens with hand-tied knots). With a little practice the knots can be tied very quickly and neatly.

The instrument is very useful for tying deep ligatures or buried sutures.

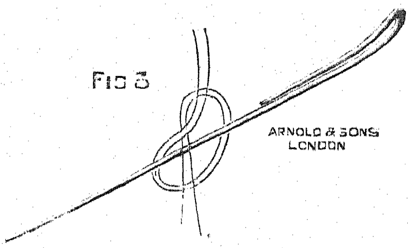
To tie knots with this instrument, the ends of the suture are picked up and held between the thumb and finger of one hand, and pulled in between the arms of the instrument, to near the bend. The thumb and finger then let go the ends of the suture, and take hold of it below the instrument (fig. 1). The instrument

FIG 2



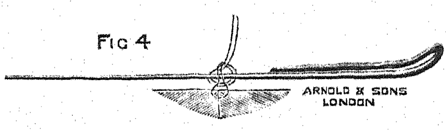
is then moved downwards and around, forming a simple loop with the thread, and then moved around the part of thread below the thumb and finger and back through the loop already formed (fig. 2). The instrument is then pulled or pushed on till the ends

FIG 3



of the thread come out from between the arms, the hand holding the instrument changing its hold at a convenient time, leaving the knot formed around the long arm (fig. 3). The thumb and finger then let go their present hold, and again take hold of the ends

FIG 4



of the thread. The knot is then passed downwards, by a pulling or rolling motion of the instrument pulling against the finger and thumb, till the suture or ligature is sufficiently tight (fig. 4), and then the instrument is withdrawn, leaving the knot completed and in place.

The instrument is manufactured in a variety of sizes and forms by Messrs. Arnold and Sons, Giltspur Street, London, E.C.

Translations.

ASEPTIC NECROSIS IN THE PEDAL BONE.

By Veterinary-Surgeon HENRICHSEN.

Aachen.

A horse on a coaching tour fell lame on the near fore-leg without visible cause. It put its toe to the ground, but placed no weight on the limb. Pulsation at the shin bone was greatly increased and over the middle of the external cartilage there was a well-defined, little-sensitive, hard swelling. It plainly bulged out the normal level of the skin. This swelling was free from fistulous openings or cicatrix and only caused œdema, and after treatment, such as fomenting, counter-irritating, and thinning of the hoof, it had disappeared. The horse was cast on the right side and narcotized; the hair over the whole cartilage was shaved, and Esmarch's bandage applied. At the most prominent part of the swelling a soft place was felt. A hollow probe was introduced deeply into the tissue, but only a little blood came away. Bayer's quittor operation was then performed. The semicircular cut through the horn wall was limited to the boundary of the swelling, and was only taken a little above the middle of the horn wall; the laps in the skin were dissected free, and the exposed part of the cartilage removed without any diseased tissue being noticed, but a completely isolated piece of bone as large as a walnut could be seen in the middle of the cartilage. After the piece of cartilage had been removed a yellowish coloured sequestrum of bone was taken away with the forceps and proved to be part of the upper edge of the pedal bone. The piece of bone was 1 cm. long and 1 mm. broad, and lay in a hollow in the os pedis, surrounded by dirty yellow tissue. No pus was encountered, but a clear yellow serous fluid, which had infiltrated into the connective tissue and bone. The diseased place was scraped with the curette and the shoeing knife. There was a rather large hole left in the bone, which appeared surrounded by decay, as well as the whole infiltrated part. A small piece of skin was snipped out at the lower angle of the wound and the skin laps sutured, then a strip of iodoform gauze was put over the wound and an antiseptic pressure bandage put round the foot.

The horse was allowed to rise and led into the stall. In the course of a few days the horse began to stand on the limb, but the bandage was kept on for twelve days. When it was taken off the wound had healed, new horn had grown and only the place where the skin was snipped out remained unhealed. In eight days the horse was at work in the field with a light bandage on, and a few days after he went to work on the streets again. He showed slight lameness at first, but this soon went away, and four weeks after the operation he was used for his usual work.

(*Deutsche Tierärztliche Wochenschrift.*)

FOREIGN BODY OF THE RETICULUM AND LUNG.

By L. LEPLAT, Veterinary Surgeon.
Roubaix.

A Dutch cow, about eight years old, was sent to be slaughtered. She was in fairly good condition and only showed a little respiratory trouble—breathlessness. On opening the carcase there was adhesion between the lung, the diaphragm, and the reticulum, these organs being united like a spitted kidney by an umbrella handle. In the reticulum there was present only a few centimetres of metallic tubing, arrested by the washer, which serves to fix the wires or whale-bones; all the remainder was lodged in the lung in the middle of a gangrenous focus, filled with liquid giving off a very disagreeable odour; for the rest the lungs seemed healthy and quite capable of free respiration.

I may add that the cow seemed not to suffer from the foreign body. She was fat and gave good meat of second quality.

(*Recueil de Médecine Vétérinaire.*)

CHRONIC PROLAPSE OF THE UTERUS AND BLADDER IN THE BITCH AND ITS CURE.

By Professor UDRISKI.

During the autumn of 1910, a confrère at Galatz sent us a three-year-old French setter bitch belonging to Madame M. B. The animal was placed in the surgical section of the School for a chronic prolapse of the uterus, existing some weeks, and which had been treated in different ways by local confrères.

On September 30, the day of entrance, the bitch presented a tumour the size of about two fists, suspended between the lips of the vulva. The tumour was red with violet folds and soiled slightly by the dejections; the mucosa was detached in certain places; in its centre it showed an opening which was no other than the neck of the uterus; on one side of it there was a small orifice by which a yellowish liquid, having an odour of urine, escaped in drops. The sound was introduced into this orifice and curved itself round into the bladder, which was itself comprised in the hernial contents. We thus diagnosed prolapse of the uterus, complicated with that of the bladder. Reduction was easily made, but recurrence immediately followed.

After preparation of the organ it was returned and sutured with a semicircular suture in such a way that urine could escape at its lower part.

The suturing did not succeed, for the patient pulled out all the points with her teeth, in spite of every precaution taken to maintain them.

A bandage made out of a piece of skin with a hole in, through

which the lips of the vulva protruded, was then made and kept on for two days, but this was pulled off.

After these trials we had recourse to hysteropexia. During this period the condition of the animal got worse; she was very thin, and ate badly, and gangrenous patches developed in the uterus.

Previous to operating, the animal had been submitted to an absolute diet for twenty-four hours. She was chloroformed and laparotomy performed in the middle line. It was seen that the uterine coruna were very much distended. The organ was then reduced after previous catheterization of the bladder and drawing off a good quantity of urine.

The right uterine horn was then fixed to one side of the abdominal wall with catgut, the other was attached to the body of the uterus, exercising light traction upwards and anteriorly. The suture in the abdominal wall involved the peritoneum and abdominal muscles; in the genital organs the serosa and muscularis were transfixed without penetrating the internal cavity. The abdominal wound was closed with three rows of sutures; one peritoneal another musculo-aponeurotic; both of catgut; the third cutaneous with silk.

The wound was sealed with sublimated collodion and a bandage applied. Milk diet was recommended. The result of the operation was very satisfactory. There was no fever, the animal was lively and had a good appetite. During some days boricated solutions were injected into the vagina.

We awaited a complete cure, but after some days we observed that a small tumour, the size of a nut, had made its appearance between the lips of the vulva. The laparotomy wound had healed per primam and the tumour was only half its previous size, viz., 5 cm. in antero-posterior diameter, whereas formerly it was 12 cm. A fresh laparotomy was performed at the old site and it was found that adhesion had taken place at the previous points of suture. It was now resolved to fix the bladder to the abdominal wall. Between the abdominal wall and the genital organs certain little pedicles were found which being distended did not permit of normal connections between the genital organs.

This time the depths of the vagina were fixed to the abdominal wall by a suture in the form of a cross. This suturing was made easy by vaginal support given during the whole of the operation. The anterior part of the bladder was fixed to the abdominal wall by a suture. Thus a *cysto-vagina-hysteropexia* was performed. The operation at an end the previous after-precautions were taken. No return of the prolapse has occurred and the operation has been completely successful.

Cadiot, in his clinical lesson on two cases of prolapse of the uterus, says: "Tampering of the deep part of the vagina, which was done in these two cases, is the treatment of choice in prolapse of the womb in the bitch. Since 1896 this has always been done here. We have not had to practise amputation." We consider Cadiot has been very fortunate in his cases.

L. Auger, in the *Journal of Veterinary Medicine and Zoo-*

techny, August 31, 1910, reports three cases of retroflexion of the bladder treated by cystopexia in the bitch. Commenting on this, Auger says: "In the three cases I report cystopexia has been effective, and that is why, in my opinion, it is the treatment for choice."

I am entirely of M. Auger's opinion.

(*Arhiva Veterinara.*)

HÆMOGLOBINURIA OF THE HORSE AND ITS TREATMENT.

By M. V. DROUIN.
Alfort.

An index as to the obscurity of a problem is furnished by the abundance of publications concerning it. There are few subjects that have provoked so many articles or so much controversy as paraplegic hœmoglobinuria in the horse.

Professor Arloing held that it is a primitive affection of muscle, *a toxic myositis*. It gives the appearance of paralysis followed by functional impotence of the muscles of sustentation. It is accompanied by ejection through the urinary tract of muscular methemoglobin, which alters the kidney in its passage, determining uræmia and secondary lesions of the different parenchymas.

The histological lesions of hæmoglobinuric muscle have been well studied. The intoxicated muscle takes on a salmon colour and loses all tonicity; it tears under the least effort and rupture of the psoas or triceps muscle is one of the worst complications that arises through being obliged to drag a horse when he has fallen.

Diagnosis is not hard, but in those cases, due to location in the anterior muscles, the water may have cleared up and the horse got all right by the time the practitioner arrives.

There is considerable difference of opinion as to prognosis. Many practitioners call it a benign disease, others consider it the reverse. There are different reasons for these divergencies of opinion. Races vary in sensibility as well as in their surrounding conditions. If cures are more frequent in the country than town, it is because the invalids can be stopped and stabled where attacked.

Thus Lucet has not lost one case out of eighty-five.

A subject attacked must be put in a state of *absolute and immediate repose*, then one must facilitate the elimination of the toxic substance and the dissolved hæmoglobin, which is itself a poison. Carry out treatment where the horse falls if possible. Nothing seems to us worse than transport of a paraplegic in a float. Traction on the limbs ruptures the muscles and the noise of the travelling vehicle upsets the patient.

Drouin strongly advocates compresses to the loins. The effect of either heat or cold has been almost the same in his

two sets of cases. Purgation not too drastic is advocated. Emptying the bladder, too, is important.

As remedial agents, 50 to 70 grm. of bromide of sodium, 3 to 5 grm. of bromide of potassium every two hours, combined with 500 grm. of sugar every six hours, or iodide of potassium 15 to 25 grm., associated with salicylate of eserine 10 centigrammes, and 500 grm. of bicarbonate of soda four times daily, have been used successfully.

Drouin considers theobromine worthy of trial. He discountenances with reason all attempts to suspend animals incapable of standing, and characterizes such procedure as useless and dangerous.

(*Revue Générale de Médecine Vétérinaire.*)

ACARIASIS IN THE HORSE.

By Chief Veterinary-Surgeon Dr. BERGER.

During last winter I had the opportunity of seeing a case of acariasis in the horse.

Attention was called to an officer's horse whose hair had been falling out at the side of the neck and during the last three days had been increasingly shed and was accompanied by itching. I was disinclined to believe the officer's servant on this last point and attributed the loss of hair and irritation to friction from the bridle. I therefore had it covered with smooth linen and disinfected the place on the skin with 1 per cent sublimate solution. At a second examination eight days after there was no betterment or renewed growth of hair and the bald place had increased to double its original size. The assertion as to the itching was repeated and a thorough examination was made. There was now not only desquamation of the epidermis, but an intensive inflammation of the skin, with the formation of nodes the size of a millet seed and isolated pustules. The skin was thickened and showed incrustations. Microscopic examination of the shaved skin showed the presence of acarus folliculorum, also of acarus mites of the exact kind I have often seen in dog practice.

A short time previously I had attended the dog of the owner of this horse for mange. The question arose whether the servant had used the horses brush to clean the dog. My suspicion was confirmed by him. In this case the affection was conveyed from the dog to the horse by cleaning, and acariasis caused on the neck of the horse.

Literature, as far as my knowledge goes, only records conveyance of acari of the dog to man by means of the wide sebaceous glands. This observation, recorded by me, shows that dog acari can be conveyed to the horse and calls for careful examination of acarus mites on hairless places in the horse.

(*Zeitschrift für Veterinärkunde.*)

EMPLOYMENT OF IODIDE OF POTASSIUM BY FRICTION.

By LANCELEUR.

Mode of Preparation.—Take 5 grm. of pot. iodide powder it in a mortar, add some drops of glycerine, which perfectly dissolves the iodide, and incorporate 20 grm. of mercurial ointment.

Method of Employment.—It is absolutely essential to prepare this ointment at the time of using it. If twenty-four hours old it gives no result. To rub in, clip the hair, spread the ointment with the finger and rub vigorously from three to five minutes with a very hard tampon. Twelve hours after vesicles may be seen, but there is never any itching. Slight tumefaction soon diminishes and the epidermis dies and falls off ten days after.

Indications.—The results are particularly gratifying in hæmatomas of the knee. Against tumours of the withers following pressure and friction from the harness. Three or four repeated frictions cured deep cysts. The results obtained in tendon sprains have often been better and always as good as those obtained by biniodide of mercury, firing, or insufflations of air. In these cases absence of all irritation permits renewal of the frictions every six or seven days.

(*Revue Vétérinaire Militaire.*)

Letters and Communications, &c.

Major Baldrey; Professor Duncan; Professor J. S. Jones, Mr. J. B. Buxton; Mr. W. Lothian; Mr. J. A. N. da Cunha; Mr. L. M. Douglas; Mr. E. W. Greening; Captain Nicholas; Mr. R. E. Philp; Mr. T. S. Price; Mr. R. F. Stirling; Board of Agriculture and Fisheries; Department of Agriculture and Technical Instruction for Ireland.

Books and Periodicals, &c., Received.

"Meat and Food Inspectors' Examinations" (Baillière, Tindall, and Cox); Record of Sports (Royal Insurance Company); Bulletins of the Bureau of Sleeping Sickness; Proceedings of the Royal Society of Medicine; Bureau of Animal Industry, U.S.A.; London University Gazette.

NOTE.—All communications should be addressed to 8, Henrietta Street, Covent Garden, London, W.C. Telephone, 4646 Gerrard. Telegrams, "Baillière, London."

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Dr. S. S. Cameron, M.R.C.V.S.

THE

VETERINARY JOURNAL

JULY, 1911.

DR. S. S. CAMERON.

THE appointment of Mr. S. S. Cameron, D.V.Sc., M.R.C.V.S., to the high position of Director of Agriculture and permanent head of the great agricultural department of the State of Victoria, is one that affords much pleasure to his numerous friends throughout the Commonwealth of Australia.

Dr. Cameron, whose photograph we publish in this issue. qualified as M.R.C.V.S. in 1888, after a brilliant career at the New Veterinary College, Edinburgh. Soon afterwards he was appointed to the Melbourne Veterinary College, where he proved an able first lieutenant to Dr. W. T. Kendall in the building up of the new school.

In 1895 he accepted the appointment of Veterinary Officer to the Dunedin (N.Z.) City Council, but a year later he returned to Victoria as Veterinary Officer to the Board of Public Health. In this capacity he was the means of inaugurating extensive reforms in the slaughtering of stock for the metropolitan meat supply. So successful an official of this department did he prove that in 1906, when the Government decided to establish a veterinary branch of the Agricultural Department, his abilities received the recognition they deserved and he was appointed Chief Veterinary Officer to the State, and soon afterwards the whole administration of the Acts relating to live stock was placed under his control.

The Stock and Dairy Supervision Act is chiefly his creation, and in the administration of this he, along with the Veterinary Branch, has earned high praise from the community. In addition

to the ordinary routine duties, Dr. Cameron four years ago secured the approval of regulations he drafted providing for the examination and registration of stallions throughout the State. That both the principle and the methods of administration have proved successful is evidenced by the fact that during the past year they have been followed practically in their entirety by the other States of the Commonwealth.

In 1909 the University of Melbourne conferred the degree of Doctor of Veterinary Science on Mr. Cameron for his thesis on hereditary unsoundness in horses, which has been published in this Journal, and contains data and observations of very great value. Recently the Directorship of Agriculture became vacant and the State Government offered Dr. Cameron the position, feeling confident as a result of his previous services that he could thoroughly re-organize the Department and lead it into a state of complete efficiency. That his capacity and labours are thoroughly recognized is shown by the following extract from a leading article in a paper which, although criticizing somewhat pessimistically his new appointment, has nothing but praise for his past achievements:—

"Dr. Cameron undertook the work of seeing that clean milk was supplied to the people of this State. Under his authority the Dairy Supervision Act was administered. Cans were decently treated. Dams had to be kept clean and wholesome. The risk of contaminated milk was reduced to the lowest possible limit. This was a great work, for which Dr. Cameron is deserving of the highest praise."

We heartily congratulate Dr. Cameron on his new appointment.

Editorials.

THE USE OF THE ARMS AND CREST OF THE ROYAL COLLEGE OF VETERINARY SURGEONS.

In an editorial note in our June issue, we referred briefly to the above matter, and drew attention to a paragraph in the annual report of the Royal College of Veterinary Surgeons, in which it was stated that members of the Royal College are not entitled to use the armorial bearing on their stationery without paying duty. Such is the opinion of counsel. It would appear that the practice was an indulgence granted by the Board of Inland Revenue, and that the collecting of the tax has changed into the hands of the county councils, who are attempting to enforce the payment of such duty. At the time we referred to the matter there was a case *sub judice* in which Mr. Kirk, a London veterinary surgeon, and himself a barrister-at-law, was sued for the amount of the licence duty by the London County Council. We are very glad indeed to state that the learned magistrate, Mr. Curtis Bennett, did not adopt the same attitude as counsel who was consulted by the solicitor of the Royal College of Veterinary Surgeons, and he decided in Mr. Kirk's favour. He pointed out that it is not a personal matter, but the use of the arms and crest by members of the Royal College of Veterinary Surgeons for business purposes is simply an indication of membership of the College and as such is permissible. The practice has been observed years longer than the oldest amongst us can remember, and it is indeed strange that it should now be considered illegal by the tax-collecting authorities. If it be so, then every member of a club who uses notepaper bearing his club's crest, and every public schoolboy who uses similar paper with his school's crest, must be liable for the payment of the licence duty. Surely such a contention could not stand, and one might be forgiven for regarding it as absurd.

We are given to understand, however, that this decision is not to be allowed to go unchallenged, and that the L.C.C. taxing authorities have given notice of appeal against it. Now we consider that this is a question that is of importance to every member of the College, and that the appeal should be resisted to the utmost. Moreover, it should not be left for one man to bear the

whole of this expense, which no doubt will be considerable. Obviously the right thing is for the Council of the Royal College of Veterinary Surgeons to take the matter up and support Mr. Kirk to resist the appeal. But unfortunately the funds of the College are not in a position to permit of that, and therefore any support must come voluntarily from members of the profession. This suggestion has been well voiced by Professor Woodruff, the Editor of our weekly contemporary, *The Veterinary News*, who is prepared to organize a fund for the purpose. We commend it strongly to our readers, and ask them to send along at once any sums they are willing to contribute to assist in preserving to us what we consider our legitimate rights. The proprietors of THE VETERINARY JOURNAL, who have the welfare of the profession at heart, will gladly contribute two guineas to the fund, and any remittances that come to hand we will hand over to the proper quarter.

This is another item to be added to the long list of things the Royal College might take up on behalf of the profession if it were only put in possession of adequate funds.

THE NATIONAL VETERINARY ASSOCIATION.

THE annual meeting of this Association is to be held this year at Carnarvon during the last week of this month. This will be the first visit of the National to the Principality, and the President, Mr. T. S. Price, together with the energetic local committee, headed by Mr. R. Hughes, of Oswestry, as Chairman, and Mr. L. W. Wynn Lloyd, of Carnarvon, as local Secretary, are doing their best to make it a very memorable one.

An excellent programme of papers has been arranged on subjects of the highest importance by gentlemen who are acknowledged experts in their particular subjects. "Surgical Shoeing" is to be dealt with by Mr. H. Sumner, M.R.C.V.S., and Mr. E. A. West, F.R.C.V.S., two men with exceptional experience in the subject. "Economic Feeding of Horses and Cattle" is to be introduced by Mr. Henry Taylor, F.R.C.V.S., who is an Examiner in Dietetics for the Royal College of Veterinary Surgeons, and the discussion is to be opened by Professor Woodruff. We are to get two papers on "Sclerostomiasis," by Drs.

Annett and Leiper, than whom nobody is more capable of dealing with this difficult problem from the pathological and biological aspects, while Mr. Noel Pillers, F.R.C.V.S., will open the discussion. The remaining paper is on "Veterinary Education in Relation to Public Health," by Dr. Bradley and Mr. J. W. Brittlebank, M.R.C.V.S., who will present both sides of the question. We expect that the question of amalgamation will also be brought forward for serious, and we hope favourable, consideration. It will thus be seen that various tastes are being catered for, and it only remains for the members of the Association to turn up in good numbers and make the meeting the success it deserves.

Nor has the social element been neglected, and an excellent programme is being arranged for the entertainment of members and their wives or daughters. It will be remembered that Carnarvon is to be the scene of the Investiture of the Prince of Wales a short time before our visit, and the ancient town with its famous old Norman castle will be at its very best. Moreover, it is situated within easy reach of some of the most beautiful scenery of the world, including Snowdonia. The annual banquet, to which the ladies are also invited, is to take place at the Sportsman Hotel on the evening of the first day. The Mayor of Carnarvon has kindly promised to give a reception to members, and this will probably take place on the second day of the meeting. On the third day we are invited by the North Wales Veterinary Medical Association and the Welsh practitioners to an excursion through the heart of Snowdonia. It will probably take the form of a drive to Beddgelert, where lunch will be provided and where time will be given for those desirous of doing so to walk to the famous Pass of Aberglaslyn (1 mile). The drive will then be continued up the Gwynaut Pass, round Snowdon, and down the Llanberis Pass to Llanberis. Here tea will await us, to be followed by a drive back to Carnarvon by another route. Those who care to do so can leave the rest of the party at Llanberis and ascend Snowdon by the mountain railway and return to Carnarvon by rail.

The energetic local secretary is also desirous of arranging a golf tournament. This is an innovation and should appeal to the many members who are fond of the Royal and Ancient game. Mr. Wynn Lloyd would be glad if golfing men willing to play

would send in their names early so as to facilitate the arrangements.

It seems to us that the National bids fair to excel itself. It has certainly never met in more beautiful surroundings, the arrangements have never been more excellent, and all we ask is good weather and a record attendance.

THE VETERINARY SURGEONS ACT AMENDMENT BILL.

In our last issue we commented on the fact that the Bill had been crowded out when it was to have been brought forward for second reading in the House of Commons on May 26, and that it was ordered to be brought up again on June 16. We regret to say that for some reason which we have not yet been able to ascertain, the Bill was not included on the Order paper for that day and consequently was not brought forward. We are very much afraid that there is now no hope for the Bill this session owing to the great congestion of business before the House, and the fact that the Bill is meeting with some opposition which will necessitate debate.

CORONATION HONOURS.

We are pleased to note that the veterinary profession was not altogether forgotten when the Coronation Honours were being bestowed.

Colonel Duck has received the honour of knighthood, and Colonel C. Rutherford, P.V.O., India, has been awarded the C.B.

Mr. W. Freeman Barrett, our President, was commanded to attend the Coronation Service in Westminster Abbey, where he represented the profession.

Major-General R. Pringle, C.B., D.S.O., represented the Veterinary Division of the War Office Staff in the Coronation procession.

General Articles.

QUESTIONS *RE* SPAVIN.*

By W. HUNTING, F.R.C.V.S.
London.

I SHALL commence by offering a definition of spavin with a view merely of limiting the subject, and of showing the condition about which I am thinking when offering answers to the questions. I am not referring to the so-called "occult spavin" or to bony enlargements on the postero-external aspect of the joint. My definition is—A bony enlargement on the lower and inner aspect of the hock.

Question 1.—Is spavin hereditary?

I suppose nearly the whole veterinary profession believe that it is. I do so myself. But I know one or two veterinarians who decline to adopt this view, and I respect their opinion because they have a large experience of practical breeding. The question ought to be answerable from the experience of living men, and the names and history of sires should put the matter beyond controversy. Are there any here to-night who can supply personal knowledge of sires suffering from spavin whose offspring have developed a marked number of this hock unsoundness?

When the Royal College of Veterinary Surgeons was consulted by the Royal Commission on Horses, the Royal Agricultural Society and the Hunters' Improvement Society as to what diseases should be considered hereditary, circulars were sent to the whole profession and answers returned by a large proportion of the members. If those replies are in existence they probably contain the evidence I desire.

Question 2.—Does any conformation of hock predispose to the occurrence of spavin?

The various conformations are included in such descriptions as straight, sickle shaped, strong, weak, wide, narrow, and tied in below. My own experience is that conformation is not a factor in the production of spavin. Some years ago I made a practice of noticing the form of hock in which I found spavin. The

* Read at the June meeting of the Central Veterinary Society.

opinion I came to was that it might exist in any form of hock, and that every form of hock might be found without spavin.

Question 3.—Does it arise in the ligamentous or osseous structures?

I believe spavin commences as an ostitis. In any *post-mortem* examination of a spavin bony changes are the most marked lesion, and usually these changes are most extensive. I cannot believe that any damage to ligaments would set up inflammation not of one bone but of many, and yet leave the main articular surfaces (the tibia and astragalus) usually unaffected. If the disease commenced in the ligamentous structures we should expect lameness to occur suddenly and to be most intense during the first few days. There are such cases in which the symptoms of spavin are well marked. They occur suddenly, are accompanied by heat and swelling, and cause great pain and lameness. They are usually followed by some fibrous thickening around the joint, and may even cause fibrous-anchylosis, but I never saw one which on *post mortem* disclosed any articular destruction or union of bones.

In cab-horse disease, in ringbone, and in navicular disease we have conditions which are certainly the result of ostitis—of disease commencing in the bone and not in the ligaments. Reasoning from analogy, when we recognize in spavin lesions so closely resembling the changes found in the conditions I have just mentioned, we may conclude that the origin and progress is the same in all. Ostitis, like any other inflammation, may spread. As it extends through a bone it may reach the periosteum and thus cause visible exostosis. It may reach an articular surface, and there cartilage becomes affected with the usual result—destructive inflammation. When the cartilage is destroyed bony union takes place between the rows of small bones. All this seems inconsistent with the theory that the primary changes are in the ligamentous structures.

Question 4.—Is the enlargement or the lameness first apparent, or are they simultaneous?

As a rule, when a veterinary surgeon is called in he finds lameness and an enlargement. It does not at all follow that both arrived together, as the owner might have overlooked a slight lameness, and cannot be expected to have recognized a slight swelling with or without pain and heat.

The answer to this question affords some evidence bearing on the previous question. If we could say that lameness usually existed for a time previous to the appearance of enlargement, that fact would suggest that an ostitis was in existence. If it could be shown that an enlargement always appeared before or at the same time as lameness, we might be induced to credit the periostitis to a ligamentous change such as we acknowledge in splints. In an odd case or two, when I have known the horse previous to lameness appearing, there has been an intermittent stiffness for some days before the appearance of any enlargement. This stiffness or lameness was only apparent at starting, and was not suspected as being the first sign of a serious unsoundness.

I remember a case in which I diagnosed hock lameness but could discover no enlargement. The practitioner who was in attendance assured me that at the commencement of lameness—about a month previous—there was a distinct enlargement which had gradually subsided. The horse was fired and became sound. Was the enlargement osseous or only soft effusion? I know that in young horses spavins can develop with great rapidity, but I have no experience of their appearing and subsiding.

Question 5.—Is there any definite alteration of action which indicates spavin lameness?

The question may be put in another way—Is it possible for an experienced practitioner to diagnose spavin by the way in which a horse moves his hind legs? I confess I cannot diagnose spavin by merely noting the action, and I venture to doubt whether any other man can do so. Of course, when you have put aside foot lameness and fractures of the pelvis, all the other hind leg lamenesses come out about 90 per cent. of spavin. So that if you only guess instead of diagnose you will come out with a heavy proportion of success in practice. But here we do not want guesses, except so far as they help us to doubt and test.

It is quite certain that so long as the muscles and tendons connecting the stifle and hock are normal those two joints must work synchronously, and that any limitation of one must cause defect in the extension and flexion of the other. Hock-lameness exists, but its special symptoms are best recognized when we are quite sure that the lesion is not in the foot, the pelvis, or some other part of the hind limb. For my part I very confidently deny that there is any lameness which is correctly described as "hock lameness." Perhaps I ought to qualify this statement

by saying that a hind-leg lameness which gradually disappears on exercise may be credited to the hock. This continuance of lameness with its temporary cessation on work is, I admit, a useful guide, but what I deny as diagnostic is any form of action by which a man can say at sight—"that is due to hock mischief."

Question 6.—How does spavin cause atrophy of the gluteal muscles?

This atrophy only occurs when a horse lame from spavin is kept at work. A horse, say, in an omnibus, performs a daily journey of sixteen miles. He starts lame but in a little time goes apparently sound. On returning to the stable he soon shows signs of pain, and rests the leg. If he be put in a loose box and not worked, the wasted gluteal muscles begin to fill up. How does this fact tally with the theory that atrophy results from disuse? When the horse did daily work gluteal wasting took place, when rested in a box the atrophy ceased to develop and in time disappeared.

This fact puzzled me for a long time, but I think I have found the explanation. So long as the horse worked, the painful condition of the hock remained and in the stable was aggravated. He therefore rested the limb and the gluteal muscles were in disuse all the time between journeys. In other words, during twenty out of the twenty-four hours of the day disuse was marked. When work ceased altogether, pain in the hock abated and the gluteal muscles gradually came more into use and atrophy ceased.

Question 7.—Why does the pastern become upright and the horse go on his toe if spavin lameness persists? I look upon this sequel of spavin, not as due to a positive contraction of muscle, but as a shrinking of tendons and ligaments to suit the most constant position of the limb. The fetlock is flexed to give ease to the painful hock, and the ligaments adapt themselves to the acting conditions.

Question 8.—What is the best treatment?

There may be difference of opinion as to the best method of treatment, but I think there can be only agreement as to the desirability of commencing treatment immediately any lameness is detected and located. Many cases of spavin show only slight lameness in the early stages, and what lameness there is passes off with exercise. Owners do not like losing the services of their horses and are apt to argue—"this lameness is only slight

in a month or two I shall not require the horse so urgently, and I will then have him treated." My experience leads me to believe that these are the cases which remain lame and which no treatment benefits. The time to treat spavin is at its commencement and then we may hope that the ostitis will cease when all the bones affected are united.

I have tried blistering, and not had much success. I think as a rule sufficient rest is not given when blistering is adopted.

Firing I rely on as the best treatment. I fire in transverse lines, but put one puncture through the skin over the most prominent part of the spavin. With this I require three months' rest.

Setons I have used and seen used with tolerable success. The late Mr. Freeman, of Hull, did quite a special practice. He made an opening in the skin an inch or two below the spavin, then with a blunt seton needle passed upwards separated the skin over the spavin. Into the cavity thus formed a piece of tape soaked in solution of corrosive sublimate was inserted and left for twenty-four or forty-eight hours. Attention was given to the wound for some days. There was much swelling and some suppuration. The wound was kept open by passing a probe into it, and pressing the fingers downwards over the track of the seton got rid of the pus.

Some years ago I gave an extended trial to cunæan tenotomy, and had many good results—about 80 per cent. This is probably about the percentage of recoveries resulting from any treatment for spavin when sufficient time is given for a long rest. The cases which did best after cunæan tenotomy were certainly those with a well-developed bony enlargement.

Posterior tibial neurectomy I have not found reliable or successful. Of the double tibial neurectomy I have no experience.

SUGGESTIONS FOR CONTROLLING TUBERCULOSIS AMONG FOOD ANIMALS.*

By J. S. LLOYD, F.R.C.V.S., D.V.S.M.
Chief Veterinary Inspector for the City of Sheffield.

It will be useless taking up the time of this meeting in discussing the inter-communicability of human and bovine tuberculosis, because I think the conclusion of the Royal Commission on Tuberculosis, that the disease in animals and man is one and the same, is now generally accepted. That, I take it, is a sufficient reason why tuberculosis in food animals should be controlled, or if possible eradicated.

Remembering that horses and dogs are not generally used as food for human beings in this country, although occasionally affected with tuberculosis, those animals may be at once eliminated from the subject under discussion. Remembering also that the disease is only infrequently seen in sheep, these animals can also be left out of account, and my only remark in connection with them is to ask the questions—Why is tuberculosis so uncommon among sheep? Is it because of the open-air life they almost invariably lead? Has the sheep a stronger power of resistance to the disease than some other ruminants? I am not aware that the latter matter has been investigated. Leaving out of consideration the presence of tubercle in ground game, and birds, as being of minor importance, we can thus narrow the food animals affected with the disease and used commonly as human food, to cattle and swine.

Tuberculosis is well known to be prevalent in both these classes of animals, but I do not propose to give statistics to prove that such is the case. Granting that it is so, what are the certain results, (1) as affecting the stock-owner, (2) as affecting the consumer of meat and milk from tuberculous animals?

It has been stated by some that the individual loss to owners of cattle by tuberculosis is not great, but remembering the prevalence of the disease, the fact that a certain number die from tubercle, and that a far greater number as a result of infection are unthrifty, there can be no doubt that taken collectively, tuberculosis amongst cattle and swine must cause considerable loss to the owners of such animals. That the meat of badly infected tuber-

* A paper read at the Birkenhead Congress of the Royal Institute of Public Health.

culous carcases, and the milk of cows affected with tuberculous udders, are a menace to the health of the consumers probably no one will deny; hence, sufficient reasons why steps should be taken against tuberculosis among food animals, (1) to lessen the loss to stock-owners, (2) to safeguard the public health.

In dealing with preventive measures we may conveniently consider what has been done so far under the two headings just mentioned. To assist owners of tuberculous stock practically nothing has been done in this country except by individual effort; whilst as to safeguarding the public health, certain recommendations have been issued by the Local Government Board, with the intention of assisting inspectors of meat when dealing with the carcases of tuberculous animals, and certain limited legal powers have been given to local authorities generally under the Dairies, Cowsheds, and Milkshops Order of 1899, and to a few of the larger cities in the country under the Tuberculous Milk Clauses, to deal with milk from cows affected with tuberculosis of the udder.

It will, however, be obvious, that in thus dealing with tuberculous meat and milk, local authorities are only following in the wake of the disease and its results, whereas, for any action to be of lasting and efficient benefit, the disease should be attacked at its source.

The Second Royal Commission on Tuberculosis recommended that steps should be taken not only against tuberculous meat and milk, but also to eliminate tuberculosis from amongst farm animals, but so far nothing has been done in the latter direction, and chiefly, I think, because of the expense such action would necessarily entail.

In order to effectually discuss any measures towards the elimination of the disease, it will be well for us to consider how and under what conditions the disease is spread, and what well-established facts are now known in connection with methods of infection, which can be taken advantage of in methods of control.

It is now well known that the disease, although occasionally congenital, is not hereditary, thus giving us the foundation fact that young animals are, generally speaking, free from the disease. It has also been well established that animals housed in insanitary and tubercle-infected houses, almost invariably become victims of the disease. It has further been established that infected animals

sooner or later disseminate tubercle bacilli, from one or other of the natural openings of the animals' bodies; it may be the coughing of infective sputa from the throat and lungs, infective fæces from the intestines, infective urine and discharges from the genitals, or infective milk from diseased udders. Such being the case, can we wonder that houses inhabited by such animals become hotbeds of the disease, and that tubercle-free animals brought for housing therein soon become affected?

Taking these facts into consideration it becomes obvious, that in order to eliminate or even to control the disease amongst farm stock we must, (1) get rid of all animals suffering from the disease that are dangerously infective to other animals, (2) that houses inhabited by such dangerously diseased animals must be thoroughly disinfected before being again occupied by other susceptible animals, and (3) that young animals must be kept from contact with diseased ones, fed on non-infective food and reared in tubercle-free sanitary buildings or in the open air.

The open-air treatment of human consumptives has been proved to be of considerable benefit to patients, and its bracing qualities must unquestionably be of at least equal, if not greater, benefit to young animals.

In order to carry out the above requirements, it is apparent that two things become necessary; first, to find out when animals are diseased, and second, to know when diseased animals become dangerously infective. Thanks to tuberculin, the first is a comparatively easy matter; periodical testing being all that is necessary in order to find out the diseased animals. The second is far more difficult. It is practically impossible to know when diseased animals become dangerously infective, and the only certain and effectual way to prevent infection is by keeping the healthy and diseased animals apart. It of course follows that once an animal is known to have become dangerously infective, the only proper course is to have such an animal isolated, if not immediately destroyed.

Such then are the foundation facts to be borne in mind when discussing preventive measures, or when suggesting methods of control. They embody practically the suggestions or recommendations of the Second Royal Commission, and have been put into force as regards testing and segregation by Bang, and as regards destruction of dangerous animals by Ostertag, both with measures of success.

A serious attempt to grapple with the disease has been made in America, particularly in the States of Minnesota, Pennsylvania, Wisconsin and Massachusetts, but in all of these States the work is badly hampered by want of funds. For instance, Wisconsin is estimated to have a cattle population of over three millions, but only 41,000 were tested, either officially or unofficially, during the year 1907-1908, a rate of progress which will take about eighty years to test once all the cattle in the State. Similarly in the case of Pennsylvania with its two millions of cattle and 60,000 tested, it will take at that rate thirty-three years to test all the cattle once. It will therefore be granted that to take steps for eradicating the disease altogether, enormous funds would be wanted; even to deal with the dangerously infective animals a considerable cost would be involved, a cost which owners of stock cannot stand, and consequently must be borne by the State.

Bang, however, has shown that successful individual and voluntary effort to rear a tubercle-free herd can be done cheaply, and providing that great care is taken by the individual stock-owners concerned, great and lasting benefit results.

Two methods of controlling the disease thus become apparent; destruction of dangerously infective animals—that is, dangerous to other animals or human beings—to be dealt with by, and at the expense of, the State; voluntary attempts by individual stock-owners to rear up tubercle-free herds. The first of these methods was practically embodied by the Board of Agriculture in the Tuberculosis Order of 1909, now unhappily withdrawn. All authorities who have given careful consideration to this question of controlling tuberculosis welcomed the Order, but it met with considerable opposition from the ratepayers, because the cost was to come out of the local rates; and strange to say, city and country ratepayers opposed it for opposite reasons. Country ratepayers opposed because it would apparently benefit the public health of the towns at their expense, whilst city ratepayers welcomed the protection it gave to publich health by safeguarding meat and milk supplies, but objected to pay rate-aid for the purpose, because the Order made no attempt to assist owners and breeders of stock to raise tubercle-free herds and thus make a first attempt to reduce the number of tuberculous animals in the country.

Apparently both classes of ratepayers had good grounds for their objections, and whilst it is highly desirable that some efficient

if only preliminary steps should be taken to deal with tuberculosis among animals, it would seem that any new Order made and put into force should be supplied with State-aid for both compensation and administration, and ought to give material assistance to pioneer owners of stocks who voluntarily attempt to establish tubercle-free herds of cattle and swine. Such action would certainly tend to reduce the amount of tuberculosis among food animals by removing the dangerously infective from all herds, and would be a beginning towards obtaining clean herds in different parts of the country, the latter probably becoming centres of education for the benefit of neighbouring farmers. Further, the removal and destruction of the dangerous animals under proper veterinary supervision would in a large measure protect the public from the danger of consuming tuberculous meat and milk.

It has been mentioned above that the efforts of Bang and others in building up tubercle-free herds has been more or less successful. Failure has generally arisen through the accidental introduction of tuberculous animals into otherwise free herds; but knowledge of such a danger should cause greater efforts to be taken to prevent such an occurrence. In this country, no doubt, failures in many instances will be recorded, but persistent and steady effort by both the State and the stock-owner combined must prove advantageous in the end. It must not, however, be looked upon as more than a preliminary towards controlling the disease.

One step has been discussed, and in two countries put into force, that is "stamping out." In Belgium and Massachusetts it has been tried and failed. Taking into consideration the enormous cost it would involve and the dislocation of the cattle breeding and milk and meat producing industries that must necessarily follow, I do not suppose that such a course would be seriously considered in this country for a moment, and it can consequently be summarily dismissed from further discussion.

A second step is one which demands much more serious consideration—I now refer to anti-tuberculous vaccination. I will not describe the technique or results of this method of immunizing young cattle against the attacks of tubercle bacilli. Various veterinarians on the Continent have, however, been working at it since 1884, although it is only much more recently that serious and to some extent successful attempts have been made to carry it

out on a fairly extensive scale. Von Behring, Rossignal and Vallée have been working at it, and lately M. S. Arloing (VETERINARY JOURNAL, June, 1910) has claimed complete success in from 40 to 50 per cent. out of sixty animals treated. The method of procedure adopted by the latter observer has been to modify the tubercle producing properties in both human and bovine tubercle bacilli by a series of homogeneous cultures in the depth of 6 per cent. glycerinated bouillon, and at different temperatures and pressures. These modified cultures have been used for immunization purposes in three ways, subcutaneous, intravenous and digestive. By intravenous injection Arloing obtained 75 per cent. of complete successes, by ingestion 50 per cent., by subcutaneous injection 10 per cent. of complete successes and 73 per cent. of partial successes, and states that there is no ground for doubt and unrest as regards vaccination, and that he will not hesitate to use vaccines on a large scale.

As a preventive measure, even if only tentative, vaccination appears to me to warrant trial in this country, and as the results, whether successful or unsuccessful, would be for the good of the nation, such trials ought to be undertaken by the State.

To sum up, the only suggested measures for controlling tuberculosis in food animals which appear to me to be capable of being put into immediate action are:—

(1) An order by the Board of Agriculture compelling compulsory notification, investigation and slaughter of dangerously infective tuberculous animals—that is, animals affected with "open" tuberculosis, with compensation according to carcase value, and prosecution for failure to notify.

(2) Pecuniary assistance by the State to owners of stock who are willing to attempt the production of tubercle-free herds, and agree to carry out requirements considered necessary to obtain success, special consideration being given to the production of tuberculin, free testing, segregation, sanitary buildings, disinfection, &c.

(3) Experiments in vaccinating young animals against tubercular infection to be carried out by, and at the expense of, the State.

All the above are of course only preliminary measures; success or failure will point the way for further measures in the future.

THE TRANSMISSION OF AFRICAN HORSE-SICKNESS TO THE DOG BY FEEDING.

By LL. E. W. BEVAN, M.R.C.V.S.
Rhodesia, Post-Graduate of the Royal Veterinary College, London, and Pasteur Institute, Paris.

In view of the recent controversy as to the susceptibility of the dog to African horse-sickness, the following notes may be of interest.

From January 23 to 30 the hounds of Gwelo Hunt Club were fed on a mule that had died during the reaction following Dr. Theiler's method of immunizing against horse-sickness. On the 30th they were given the hind leg of another mule which had been inoculated six weeks previously. On February 2 (ten days after they fed upon the first mule) one hound died during the night. This animal had been noticed to be off his feed at the previous evening meal, but all the others ate well and appeared in good health. At 9.30 a.m. on February 2 the hounds "Pilgrim" and "Vixen" showed the first symptoms of the disease, and at 1 p.m. the former died, while "Vixen" died at 6 p.m. the same day. On the morning of the 3rd "Vista" and "Mentor" developed the sickness, and were dosed twice a day with arrhenal. "Vista" recovered after two days, and "Mentor" after five days' sickness.

On the evening of February 3 "Music" and "Haughty" showed symptoms, and both were removed from the kennels, the latter dying during the removal; "Music" was carefully nursed and dosed with arrhenal, but died on the 6th.

The remainder of the hounds in the kennel, consisting of 6 half-breds and 10 thoroughbreds, were not affected by the disease; one thoroughbred bitch on double rations of meat showed no signs of any sickness. For the past two or three years it has been the custom to feed the hounds on carcases of animals that have died from "horse-sickness."

About the same time 11 dogs in Gwelo, which also consumed some of the inoculated mule, died in the vicinity of the kennels; several died at the same time as the hounds and some shortly before the hounds became affected.

The symptoms described by Mr. J. A. Godfrey, honorary secretary and huntsman, and G. V. S. Rowland Williams (who proceeded to Gwelo to investigate the outbreak) were, quickened

and laboured breathing, high temperature, and death generally three to eight hours after the onset of symptoms. As the disease developed the jaws became tightly locked and the tongue a distinct bluish colour. The mouth appeared abnormally dry. Mr. Williams states that the visible mucous membranes were anæmic rather than congested.

The only *post-mortem* lesion mentioned is froth in the lungs.

On February 5 Mr. Williams kindly obtained a quantity of blood from the hounds "Music" and "Mentor," which was

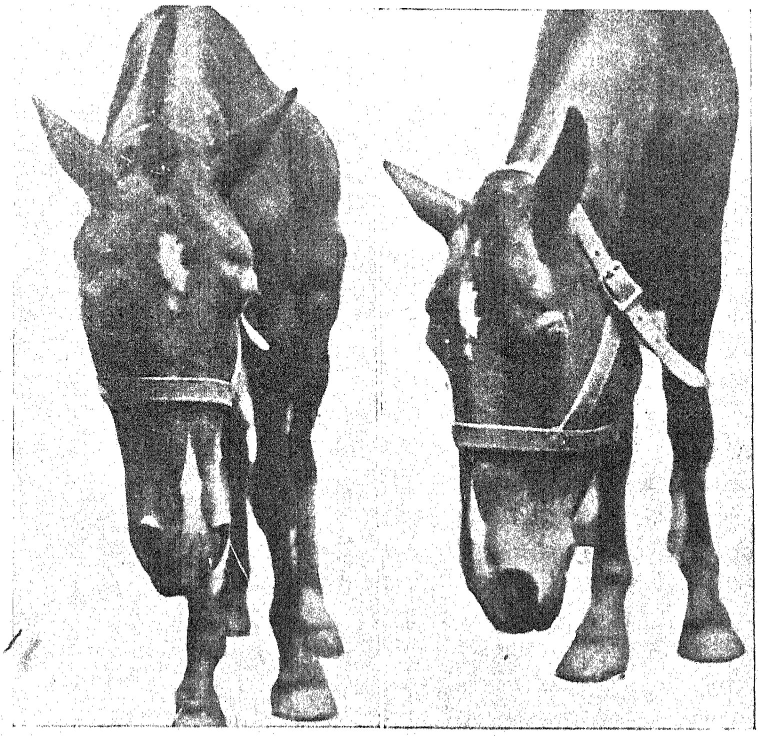

FIG. 1.

Photograph of horse "Don Q," showing "Dik-kop."

mixed with the usual glycerine, water, phenol preservative, and was brought to the laboratory where it was kept until February 24.

On that day 20 c.c. of this virus, made up of equal quantities from each hound, was injected under the skin of the neck of the horse "Don Q," which had been and was subsequently kept in

a mosquito-proof stable at the laboratory. The following is the temperature record of this animal:—

HORSE-SICKNESS.

Subject.—Bay gelding, "Don Q."
Date.—February 24, 1911, at 4.30 p.m.
Virus.—20 c.c., blood taken February 5, 1911, from hound "Gwelo" suspected to be suffering from horse-sickness. Subcutaneous injection.

Date.		No. of Days.		Morning Temperature.
February 25, 1911	...	1	...	100·4 °F.
,, 26, ,,	...	2	...	100·2 ,,
,, 27, ,,	...	3	...	100 ,,
,, 28, ,,	...	4	...	100 ,,
March 1, ,,	...	5	...	100·2 ,,
,, 2, ,,	...	6	...	103 ,,
,, 3, ,,	...	7	...	104·2 ,,
,, 4, ,,	...	8	...	104·6 ,,
,, 5, ,,	...	9	...	100·8 ,,
,, 6, ,,	...	10	...	Dead

On March 4 this horse was noticed to be extremely dull, and shifted from one foot to the other in the manner characteristic of horse-sickness ("Paddling"). On the 5th it showed the typical symptoms of "Dik-kop," and the photograph reproduced was taken.

It died early on the morning of the 6th, and *post-mortem* examination revealed the characteristic lesions of horse-sickness, notably, large quantities of straw-coloured fluid in the pericardial sac, intense hyperæmia of the villous portion of the stomach.

During the course of the autopsy portions of the heart, liver and muscles of this horse (about 6 pounds in all) were thrown to a large mongrel bitch, who swallowed them greedily and retained them. This dog was kept under observation, the following being a record of her subsequent morning temperature:—

Subject.—Large mongrel bitch.
Virus.—Fresh liver, muscles and heart of horse—dead from horse-sickness fed to bitch.
Date.—March 6, 1911.

Date.		No. of Days.		Morning Temperature.
March 10, 1911	...	4	...	102·2 °F.
,, 11, ,,	...	5	...	101·8 ,,
,, 13, ,,	...	7	...	101·8 ,,
,, 14, ,,	...	8	...	102 ,,
,, 15, ,,	...	9	...	101·8 ,,
,, 16, ,,	...	10	...	102·4 ,,
,, 17, ,,	...	11	...	101·2 ,,
,, 19, ,,	...	13	...	103·8 ,,
,, 20, ,,	...	14	...	103·6 ,,
,, 21, ,,	...	15	...	104·2 ,,
,, 22, ,,	...	16	...	103·4 ,,
,, 23, ,,	...	17	...	103·4 ,,
,, 24, ,,	...	18	...	99·6 ,,
,, 25, ,,	...	19	...	101 ,,

Date.		No. of Days.	Morning Temperature.
March 27, ,,	...	21	... 101·8 ,,
,, 29, ,,	...	23	... 102 ,,
,, 30, ,,	...	24	... 101·2 ,,

N.B.—The period of incubation—13 days—is considerably longer than in Theiler's cases, produced by inoculation when it averaged from 5 to 7 days.

On the morning of March 19, thirteen days after eating the horse-sickness meat, the owner of the dog drew attention to its peculiar behaviour, fearing that it was developing rabies. The

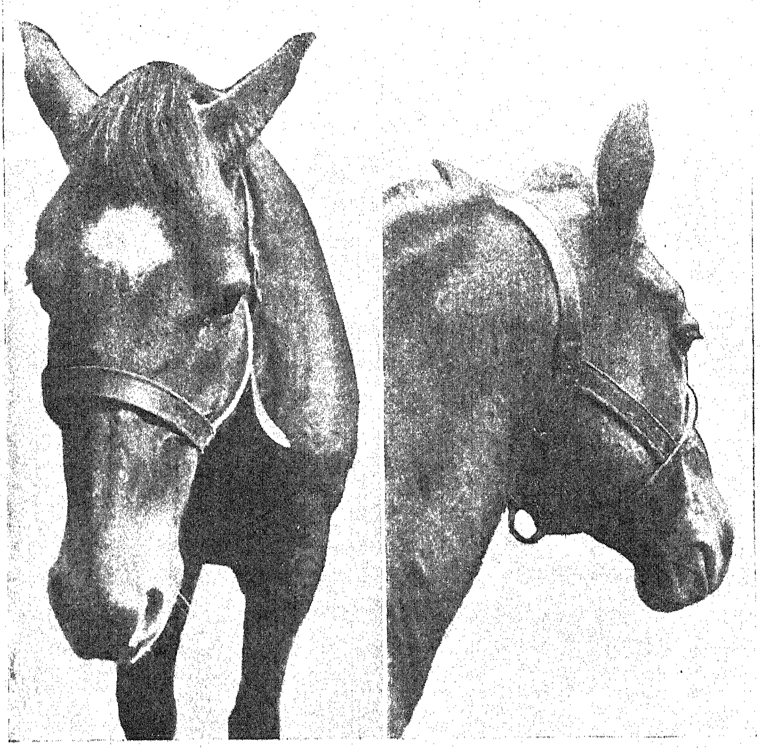

FIG. 2.

Photograph of horse "Saba," showing "Dik-kop."

animal was noticed to be excited, was snapping and rolling, and appeared to be suffering pain about the head. It frequently pawed at its mouth, from the corners of which escaped a thick saliva. This condition, while gradually improving, lasted for two or three days.

On March 21, when the temperature was at its highest, 30 c.c. of blood was taken from the dog, and, having been

citrated, was injected under the skin of the neck of the horse "Saba," a gelding some 15 years old, said to have recently come from the Orange River Colony.

On the sixth day after inoculation its temperature began to rise, and its orbital fossæ, hitherto very deep, began to fill. Day by day the symptoms of "Dik-kop" increased, the mucous membranes of the eye became almost claret-coloured, the lips and gums assumed a bluish red, a well-marked œdema accumulated between the angles of the jaw and obliterated the jugular furrow. Later the swellings above the eyes, well seen in the photograph, assumed the size of half a cricket ball. The heart-beat became slow and feeble, and the horse became extremely weak.

Subject.—Bay gelding (15 years old), "Saba."

Virus.—30 c.c. fresh citrated blood from half-bred bitch which, on March 6, 1911, was fed on liver, muscle, heart, &c., of horse "Don Q," dead of "dik-kop." Subcutaneous injection.

Date.—March 21, 1911.

Date.	Number of Days.	Temperature. Morning.	Temperature. Evening.
March 22, 1911	1	99·4 °F.	—
" 23, "	2	99·4 "	—
" 24, "	3	100 "	—
" 25, "	4	100·1 "	—
" 26, "	5	100 "	
" 27, "	6	100·6 "	108·4 °F.
" 28, "	7	102·2 "	108·8 "
" 29, "	8	102·8 "	104·8 "
" 30, "	9	103·8 "	105 "
" 31, "	10	103·4 "	104·2 "
April 1, "	11	102·4 "	103·2 "
" 2, "	12	101 "	—
" 3, "	13	101·3 "	100·4 "
" 4, "	14	99·4 "	—

Table of Passages.

Mule (died during inoculation by Theiler's method).
Dog (Gwelo Hunt Club hounds "Music" and "Mentor").
Horse ("Don Q.").
Dog (half-bred bitch).
Horse ("Saba").

Experiment to Test the Immunity of Gelding "Saba."

Virus.—2 c.c. of Theiler's virus 5383 injected subcutaneously.

Date.—April 19, 1911.

Date.	Temperature.
April 19, 1911	Inoculated
" 20, "	99·2 °F.
" 21, "	98·8 "
" 22, "	98·2 "
" 23, "	99·2 "
" 24, "	98·8 "
" 25, "	98·4 "

Date.		Temperature.
April 26,	,, ...	98·6 ,,
,, 27,	,, ...	99·4 ,,
,, 28,	,, ...	99·2 ,,
,, 29,	,, ...	99·4 ,,
May 1,	,, ...	99 ,,
,, 2,	,, ...	99·4 ,,
,, 3,	,, ...	99 ,,

It will be remembered that Dr. Theiler reported in the "Report of the Government Veterinary Bacteriologist, Transvaal Department of Agriculture, 1905, 1906," certain experiments in which he sought to infect dogs with horse-sickness, and from which he drew the conclusion that:—

(1) It is possible to transmit horse-sickness into dogs and to transmit the virulency from dog to dog. Horse-sickness in dogs has a very rapid course both in incubation and temperature reaction.

(2) The *post-mortem* lesions found in dogs are identical with those of a horse.

Professor MacFadyean, recognizing the importance of the question "where in a horse-sickness district is the virus of the disease during the six or eight months which separate successive animal outbreaks?" carried out certain experiments with the object of obtaining further evidence as to the susceptibility of the dog to horse-sickness, using infective filtrate obtained by passing diluted blood through a Berkefeld filter in order "to exclude the effects of other things than horse-sickness virus which might be accidentally present in the blood," and injecting the virus subcutaneously in small quantities on the grounds that the intravenous method was non-natural, and that it was not desirable to use an excessive quantity of infective material or one much greater than is known to be sufficient for the infection of a susceptible animal. He also considered it possible that Theiler, when infecting horses with virus which had passed through a dog, did so by reason of part of the original virus remaining in dilution in the dog.

As a result of his experiments he drew the deduction that "in view of the resistance which the dog offers to experimental infection with horse-sickness virus, it is improbable that animals of that species are ever infected in natural circumstances, or that in horse-sickness districts the canine species can constitute a 'reservoir' for the infection of horses through the medium of an insect."

Subsequently Theiler conducted certain further experiments, passing the virus from dog to dog as far as the thirtieth passage. His experiments were so modelled as to eliminate MacFadyean's objections, who, in commenting upon them, concedes that "the new and more numerous experiments . . . . . will no doubt be generally accepted as proving that horse-sickness can be experimentally conveyed to the dog by inoculation.

The conclusion which appears to be warranted by the observation and experiments made in this country is that dogs may become infected in natural circumstances by feeding on infective meat.

The question as to whether "the canine species can constitute a 'reservoir' for the infection of equines through the medium of an insect" naturally follows and is now being put to experimental proof.

IMMUNITY.

By A. C. DUNCAN, F.R.C.V.S.

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The efforts of modern medical treatment have been of recent years directed to a large degree towards prevention of disease, rather than purely curative with the aid of drugs. This is a rational outcome of increasing knowledge of the workings of Nature in the animal body.

The prevention of disease is attempted mainly along two lines, one which aims at producing an environment for animals living under artificial conditions, nearly approaching or simulating that which is found to exist in the case of animals living under healthy natural conditions, this is spoken of as hygiene. The other aims at the reinforcement of the natural powers of resistance to disease which are found to exist to some extent in all animals. This latter applies more particularly to specific organismal diseases, especially to those of bacterial origin. It is with the latter line of treatment that it is proposed to deal here.

It is noted in the first place that certain races, species of animals and individuals possess naturally an insusceptibility to certain specific diseases. This varies considerably in degree, and although in many cases infection appears never to occur naturally it may be doubted whether the insusceptibility or immunity is absolute. In the second place it is observed that animals not

naturally immune to a given disease nevertheless acquire a considerable degree of resistance to further infection after having been once subjected to an attack. This is so commonly observed, that certain infectious diseases of mankind are regarded as childish ailments, which it is rather beneficial than otherwise to have had. And the question "Has he had distemper," is one which is commonly asked by those who purchase young dogs.

Yet these diseases do at times recur, and while we in the western world regard some of them comparatively lightly, there was a time when they were veritable scourges; and there are instances to show that when they appear for the first time in a country they may cause great loss of life. For example, during an outbreak of measles in Fiji in 1876, D. H. Davies, writing in the *British Medical Journal*, says: "Out of 150,000 inhabitants, 40,000 were swept away." Again the same writer, referring to Samoa, says: "Until a few months ago measles had not entered this group. It was conveyed to Tonga, 500 miles south of us, by the New Zealand steamer 'Upolo' in June last, and from accounts we have received it nearly decimated the group." Again, in another group of islands, he estimated that 1,000 died out of 34,500. A very similar report was written of whooping cough in New Guinea.

Following these observations, immunity to certain diseases has been produced artificially in various ways.

Induced immunity has been described as being active or passive. Active immunity is produced when bacteria are inoculated into the subject, producing, it is believed, an active reaction on the part of the body tissues, and passive immunity when some of the blood serum of an animal previously actively immunized is injected into the animal to be protected.

In the earliest cases of artificially produced immunity an attempt was made to produce a mild attack of the specific disease by the former method. It was observed that an attack of cow-pox, which was thought to be similar to but less virulent than human small-pox, produced a degree of immunity to the latter disease. Consequently an attack of the milder disease was deliberately induced by transference of virulent material.

Later an attempt was made to produce a disease milder in type by attenuating the organism by heat. The methods of Pasteur for the production of anthrax vaccines afford a good

example. Still later modifications of these methods of producing immunity were introduced. The virus was attenuated by drying, by prolonged artificial cultivation, or by passage through certain animals. Combined inoculation of immune serum and virus has also been practised.

Some of these methods were at first based on observation of results. But for a considerable period research has been carried on by various investigators with a view to the discovery of the actual causes which give rise to natural immunity.

One of the earliest phenomena brought to light in this connection was the phagocytic power of certain leucocytes; indeed, at first sight this would appear to offer a complete and satisfactory explanation. The leucocytes had been seen actually destroying the bacteria, and Metchnikoff showed that they (the bacteria) actually disappeared. He and his followers were therefore satisfied that this power alone was sufficient to insure natural immunity.

About this time, however, it was shown that in the blood serum there existed substances which, even when the phagocytes were removed had the power of negativing bacterial toxins. But Metchnikoff still believed that phagocytes were the real element of protection, that the substances found in the serum were merely overplus products of leucocytes and that they played but a small part in the warfare against bacteria. He said again, "There is only one constant element in immunity, whether innate or acquired, and that is phagocytosis." Later, however, he somewhat moderated his views as far as acquired immunity was concerned, and suggested that acquired immunity was a different power from that which was inborn.

The view of Wright or the theory of opsonins is closely related to the views of Metchnikoff. In this opinion, although the actual work of destruction of bacteria is attributed to the phagocytes, these are said to be practically unable to overcome bacteria unless aided by the opsonins, found in the blood serum. And the measure of phagocytic power is the increase or decrease of opsonins in the serum.

That both of these views include a considerable amount of truth seems undoubted. That leucocytes appear to be active agents in protecting the body against microbic invasion and that there exist in the serum other active agents contributing to the

same work seem equally clear. Moreover, it has been shown that there are substances in the serum which themselves can negative the action of toxins.

What these various substances in the serum are has been the subject of much controversy and much research, and although a great deal of light has been thrown on the matter, still the exact causes of natural immunity are far from clear.

So far as the action of serum is concerned, the views of Ehrlich are most generally accepted at present. Briefly they include the following important points: That certain substances, including bacteria, when injected into the body, give rise to the production of other definite antagonistic materials which have affinities (allied to chemical affinities) for and reactions with the substance injected. That the antigen, or substance injected, gives rise to a specific anti-substance, *i.e.*, one having affinities for itself alone and probably for no other antigen.

The anti-substances produced are of different types. First, an anti-substance which simply combines chemically with the antigen, *e.g.*, an antitoxin. Second, an anti-substance which combines and at the same time produces a physical change, *e.g.*, the production of a precipitate. Third, a substance which, by combining with the antigen, leads to the union with it of another material which has been called the complement, and which is believed to be naturally present in the serum. As a result of the union of the complement a bacteriolytic or hæmolytic action (according to the nature of the antigen) is produced.

Ehrlich has, in a very interesting manner, described his views graphically in what is now well known as his side-chain theory, in which the cells of the body are shown as possessing receptors which are primarily intended for the absorption of food. Whatever be the exact truth of all these views, they have certainly given rise to practical and far-reaching results, *e.g.*, in the use of immunizing sera, the estimation of the opsonic index, and in diagnosis by the use of Widal's or the agglutination reaction.

Regarded, however, from an academic standpoint, some authors and investigators are not inclined to wholly accept the views of Ehrlich. Reid, for example, in a critical review of the subject, seems to regard them as fanciful, incapable of proof, and contrary to our knowledge of the working of Nature elsewhere. He says: "It is improbable in the last degree, that the

animal body is a species of magic bottle, instantly capable of producing at need highly complex chemical substances, the antitoxin, which exactly neutralize other equally complex substances, the toxins, the right antitoxin at the right time; or that each toxin contains or is capable of being converted into substances chemically antagonistic to itself and to no other toxin. If this happens, it is a fact unique in Nature, nothing else like it is known to occur."

Reid, in the same work, endeavours to show that immunity is a normal physiological reaction, and that "acquired immunity is part of the general power of making useful acquirements in particular directions which is possessed by all the higher animals: that the habituation is by way of weak toxins to strong toxins." He suggests that the result is brought about by the digestion of toxins, so that there are present in the animal's blood, toxins in all stages of attenuation.

In each of the foregoing theories there would appear to be the truth, yet not the whole truth, for while each is supported by strong proof, in each case there has also been adduced strong evidence of insufficiency.

If any one of these theories were wholly correct, then we should expect to be able with comparative certainty to induce immunity to any disease of which the causal organism were known by the particular method suggested. Yet how different is the actual case. Out of a very large number of attempts at the production of immunity, but a very few have given anything like certain results, some are erratic, while others have proved of but little effect.

The writer would offer the proposition that the causes of immunity, natural and acquired, are not to be found in any one or two elements in the body, but in a large number of correlated factors, some of which have been carefully worked out while others have received but scant attention. This would account largely for the inequality of results obtained, markedly successful in some cases and inefficient in others.

In addition to the theories alluded to above, the factors of use, acquirement, and natural selection, alluded to by Reid, probably play a most important part.

This phase of the question is a very wide one and still very obscure, but it is worthy of consideration.

The process of stamping out contagious diseases in animals which has proved so successful in modern times may possibly tend to obscure from our observation the effect of natural selection in disease among the lower animals. But in man we find a tendency to freedom from certain bacterial diseases in older countries, or at any rate a considerable reduction in virulence in spite of increase and crowding of population, which must in part at least be due to what we may for the present term hereditary acquirement.

In the vegetable kingdom we find a somewhat analogous condition which may be helpful in our considerations regarding animals. The breeding of plants immune to certain plant diseases has passed beyond the merely theoretic stage. An example is seen in the breeding of rust-immune wheats on Mendelian principles. Here we must look beyond the fungicidal action of plant cells for the explanation of the immunity.

An allied factor is the variation in the virulence of the organism; and this consideration raises afresh the whole question of the identity of specific pathogenic micro-organisms.

When so much has been learned, after years of toil by our wisest investigators, it is difficult to return so far along the line; but if we have proceeded along side-tracks to various truths and find a difficulty in correlating them, the safest plan will be to return and see where, if anywhere, we have diverged from the broad highway of biological principles.

We may safely assume, as has been said, that the pathogenic organisms have reached their present mode of life by a long process of evolution from saprophytic ancestors, otherwise we should be driven to conclude that they had arisen spontaneously or else as an integral part in the evolution of primitive man. These pathogenic organisms adapted themselves to a parasitic mode of life. Some of them even now can return to a saprophytic existence if necessary, as, for example, the tetanus bacillus. Others have greater difficulty in resuming ancestral habits. From comparatively few there have evolved large numbers. That some of these may be merely variations of earlier types adapted to new environment is at least worthy of consideration. The possibility becomes clear when we consider the history of a few of the known pathogenic bacteria.

The tubercle bacillus was found in somewhat similar lesions in various animals, but owing to variations in morphology, growth on media and susceptibility of experimental animals, a

dual or multiple character was assigned, some distinguished between avian and all others, some separated the bovine type. But it is seen that nearly all bacteria vary in some or all of these characters under different environments, in artificial media especially, then why not in a living host, and it was found in the case of the tubercle bacillus that after a time it would adapt itself to growth in media living and artificial which were considered before as incapable of nourishing it.

And the tendency to consider the different varieties as similar or very close relations grew. We read some years ago the idea expressed by Straus that "the differences between the two bacilli are certainly very striking, but is it not possible that there may be transition forms between the two bacillary varieties? In other words, are not the two bacilli merely races of the same organism and not actually distinct species?" This view, of course, is now widely held.

Again the bovine race was formerly considered to be immune to the glanders bacillus, but experiment has shown that after some trials this organism may adapt itself to life in a bovine medium.

The inference is that we may find a closer relationship between hitherto distinct diseases of men and animals which may aid us in the consideration of the production of immunity in each case.

REFERENCE TO AND QUOTATIONS FROM THE FOLLOWING WORKS.

METCHNIKOFF. "Immunity in Infectious Diseases."
REID. "Principles of Heredity."

SOUTH AFRICAN PATHOGENIC TICKS.*

BY H. E. LAWS, B.SC., F.I.C.
The Cooper Laboratory for Economic Research, Watford.

WHILST working on the subject of ticks and their eradication in South Africa the writer has often had occasion to refer to publications and general literature in connection with this work in order to refresh his memory on different points regarding the life-history of the various species of ticks, and the periods of incubation of the disease which they transmit.

Before obtaining the information desired it has often been

* From the *Agric. Journ. of the Union of South Africa.*

TABLE I.—RELATIONSHIP BETWEEN DISEASES AND THE SOUTH AFRICAN PATHOGENIC TICKS WHICH TRANSMIT THEM.

Disease	Causative organism	Incubation period	Susceptible Animals	Duration of infectivity in recovered animals	Species of ticks transmitting infection	Geographical distribution	Hosts	Moults	Phase of life-history of tick at which disease is transmitted
Redwater	*Piroplasma bigeminum*	17—18 days	Cattle	12 years and more	*Boophilus decoloratus* (the blue tick)	South Africa to Central Africa	Cattle; other domestic animals occasionally	1st, on; 2nd, on } host	Larva
					Rhipicephalus appendiculatus (the brown tick)	Ditto	Cattle; horses; other domestic animals; antelope; hare; &c.	1st, off; 2nd, off } host	Ditto
East Coast Fever	*Piroplasma* (*Theileria*) *parvum*	10—20 days	Ditto	Non-infective after recovery	*Rhipicephalus appendiculatus*	Ditto	Ditto	Ditto	Nymph and adult
					Rhipicephalus capensis (the Cape brown tick)	South Africa	Cattle and other domestic animals	Ditto	Ditto
					Rhipicephalus simus (the black-pitted tick)	Africa	Cattle and other domestic animals; wild animals	Ditto	Ditto

TABLE I.—(*continued.*)

Disease	Causative organism	Incubation period	Susceptible Animal	Duration of infectivity in recovered animals	Species of ticks transmitting infection	Geographical distribution	Hosts	Moults	Phase of life-history of tick at which disease is transmitted
East Coast Fever (*continued*)					*Rhipicephalus evertsi* (the red tick)	Africa	All domestic animals, excepting pig; many wild animals	1st, on } host 2nd, off }	Adult
Gall-sickness	*Piroplasma mutans*	3—4 weeks	Cattle	Infectivity retained after recovery	*Rhipicephalus appendiculatus*	See above	See above	See above	Nymph and adult
					Rhipicephalus simus	Ditto	Ditto	Ditto	Ditto
					Rhipicephalus evertsi	Ditto	Ditto	Ditto	Adult
Spirochætosis	*Spirochæta theileri*	—	Cattle, Horse, Sheep	Ditto	*Boophilus decoloratus*	See above	See above	See above	Larva
					Rhipicephalus simus	Ditto	Ditto	Ditto	Nymph and adult
Biliary fever of horse	*Piroplasma equi*	—	Horse	Ditto	*Rhipicephalus evertsi*	Ditto	Ditto	Ditto	Adult
Malignant jaundice of dog	*Piroplasma canis*	—	Dog	Ditto	*Hæmaphysalis leachi* (the Cape-dog tick)	Africa, Southern Asia, Australia	Dog	1st, off } host 2nd, off }	Ditto
Heartwater	Unknown	About 15 days	Sheep, Goats, Cattle	Non-infective after recovery	*Amblyomma hebræum* (the bont tick)	South Africa to Central Africa	All domestic and many wild animals	Ditto	Nymph and adult

* Dönitz, W. (1910), "Die Zecken Südafrikas," p. 430.

TABLE II.—PERIODS OCCUPIED BY THE VARIOUS PHASES OF THE LIFE-HISTORY OF SOME SOUTH AFRICAN PATHOGENIC TICKS.

Species	Dropping off of replete female to egg-laying	Time from egg-laying to hatching out of larvæ	Time larvæ can exist without feeding	Time to dropping off of larvæ on repletion	Time on ground for first moult.	Time to dropping of nymph on repletion	Time nymph can exist without feeding	Time on ground for second moult	Time adult can exist without feeding	Time to dropping of adult females on repletion.
Boophilus decoloratus (the Blue Tick)	5 days or more according to season	3—6 weeks more in winter	6 months	—	—	—	—	—	—	3—4 weeks from commencement of larval feeding.
Rhipicephalus appendiculatus (the Brown Tick)	6 days	28 days to several months	7 months	3—8 days	About 21 days	3—7 days	$6\frac{1}{2}$ months	About 18 days	$9\frac{1}{2}$ months	4—7 days
Rhipicephalus nitens (the Shiny Brown Tick) *	—	—	—	—	—	—	—	—	—	—
Rhipicephalus capensis (the Cape Brown Tick) *	—	—	—	—	—	—	—	—	—	—
Rhipicephalus simus (the Black-pitted Tick) †	—	About 30 days	—	—	About 20 days	—	—	About 25 days	—	—
Rhipicephalus evertsi (the Red Tick)	—	About 30 days	7 months	—	—	—	—	About 24 days	1 year	—
Amblyomma hebræum (the Bont Tick)	2 weeks to more than 3 months	10 weeks to 10 months	7 months	4—20 days mostly from 5—7 days	About 25 days to 4 months	4—20 days	6 months	25—160 days	7 months	10—20 days

* Life cycle resembles that of *Rhipicephalus appendiculatus*, according to Theiler.
† *Rhipicephalus simus* usually feeds on small wild animals during its larval and nymphal stages.

found necessary to read through an enormous number of papers, which obviously involves a great waste of time, beside being extremely laborious. In order to avoid as far as possible this unnecessary labour it has occurred to the writer—and no doubt other workers have found the need for it too—that it would be a tremendous assistance to those interested in the subject of ticks, both professionally and as practical farmers, if tables were compiled giving the more essential points in connection with the habits and life-histories of ticks and the diseases which they transmit, so that one can refer to them without finding it necessary to read through an enormous amount of detail before arriving at the actual information required.

The writer has discussed this with Mr. Robinson of this Laboratory, and the latter has been good enough to draft two tables, No. 1 showing the relation between South African Pathogenic Ticks and the diseases which they transmit, No. 2 showing the periods occupied by the various phases of the life-history of some South African Pathogenic Ticks.

In order that the tables may be of service to the practical man, as well as others, Mr. Robinson has inserted the popular names of the diseases as well as those of the ticks which transmit them.

ROYAL (DICK) VETERINARY COLLEGE, EDINBURGH.

At a recent meeting of the Board of Management of the Royal (Dick) Veterinary College, Edinburgh, it was intimated that the purchase of a site for new college buildings had been concluded. The site, extending to about one and a half acres, is on the east side of the Meadows, and within easy reach of the University. The cost of the new buildings, which will be commenced without undue delay, is estimated at £50,000.

DEATH OF SIR RUBERT BOYCE, F.R.S.

We regret to announce the death of Professor Sir Rubert Boyce, which occurred suddenly at Liverpool, as the result of an apoplectic seizure. Sir Rubert was an excellent friend to the veterinary profession and it was mainly through his instrumentality that the Veterinary School of the Liverpool University was established.

Clinical Articles.

PARTURIENT LAMINITIS SUCCESSFULLY TREATED WITH ADRENALIN.

By P. R. THOMPSON, M.R.C.V.S.
Market Harborough.

THE subject of this note was a strong hunter brood mare, about 12 years old. She had been lent to a farmer to assist in the hay field.

Next day she showed signs of uneasiness and colicky pains and I was sent for. On my arrival I found her to be six months' pregnant to the thoroughbred sire "Blankney," and that she was about to abort. I therefore delivered the fœtus. I re-visited her in the evening and found the fœtal membranes retained and the uterus half prolapsed. The latter fact made it impossible to remove the membranes completely, so I ligatured them as high up as possible, cut off the soiled portion, and replaced the prolapsed uterus, after disinfecting it. This was about midnight. I revisited her at 9 a.m. She had retained her uterus and I had little difficulty in removing the remaining cleansings, after which I syringed her out with hydrogen peroxide solution, and left her quite comfortable.

When I returned to her in the evening, laminitis was commencing in her fore feet. She was blowing somewhat, standing on her heels, plantar arteries throbbing, and she would not allow either foot to be raised. Temperature 103.4° F. Having read in the VETERINARY JOURNAL of the successful use of adrenalin, I decided to use it, and injected 3 cc. (50 m.) of adrenalin chloride solution, 1-1,000, diluted with an equal quantity of sterile water at two points of each coronet, about an inch above the hoof. The mare also received magnes. sulph. lb. ss. in a mash, and quinine sulph. ʒiss. in bolus.

Next day the improvement was quite surprising. I intended to repeat the adrenalin, but she moved about so well and strongly objected to her foot being held, that I was unable to do so. In four days recovery was complete.

[It will be noted that Mr. Thompson injected the adrenalin into the coronet, whereas in previous reports it was injected at

the fetlock over the digital artery. It will be of interest to compare with other cases to see if one seat of injection produces better results than the other.—Eds. *V.J.*]

PROLAPSE OF THE RECTUM IN A HORSE.

By G. MAYALL, M.R.C.V.S.
Bolton.

I was called to a chestnut cart mare on June 11 that had "put her seat out." On arrival found half a foot of the rectum out with a greatly tumefied mucous membrane having a breach or crack in it about 3 in. in length on its upper surface. The mare's bowels had been loose during the previous day, but otherwise no noticeable signs of any disturbance of health had been shown. I bathed the protrusion carefully and thoroughly with a cold solution of sulpho-carbolate of zinc, using balls of surgical wool to do this. I then procured some castor oil which the owner had handy, and anointed the swelling all over with it. Proceeding to effect reduction I found the operation rather more difficult than I anticipated, but after gentle kneading I somewhat reduced the size of the protrusion, and working at the top edge of the swelling I managed to get a little of it back, and by pressing and pushing in the bottom of the eversion with my left hand I gradually effected reduction with my right. Having returned the bowel I carried tampons of wool soaked in sulpho-carbolate of zinc well into the rectum and then squeezed them out when I got them through the anal opening. The mare strained a good deal, and once or twice I expected to see that my labour had been in vain, but the bowel was not put out again, and I fastened the mare's tail down over her anus and vulva and told the owner to keep it fastened down for twelve hours. The mucous membrane of the rectum was very fragile, resembling in friability that of an inflamed liver, so that it was impossible to return the bowel without damaging its internal lining somewhat. After reduction and swabbing with the antiseptic, blood and the lotion were voided. I gave ½ oz. of chloral as a draught to allay straining. The after-treatment consisted in 2 oz. injections into the rectum three times daily

of hazeline and alum solution equal parts. Linseed mucilage has been given with all the food, manual help has been given to the mare when dunging, and she has recovered sufficiently to go to work again.

Canine Clinical Note.

ACCIDENTS.

By G. MAYALL, M.R.C.V.S.
Bolton.

If motor cars hit us in one direction they bring us patients in another. A Schipperke struck on the head and knocked yards was brought to me in a comatose state suffering from concussion of the brain. He lay prostrate and moaning. I gave him 2 doses of sal volatile in six hours space of time, and told the owner I had slight hope of his recovery. He was brought in at five o'clock, and at eleven was just lifting his head up; in the morning he was walking about with the whites of his eyes as red as those of a demon in a pantomime. He had some pot. iodide afterwards, and made an uninterrupted recovery. A fox terrier was run over by a motor car across his fore ribs and back. He bled from his mouth. Gave him a purgative dose of medicine and hot flannels and liniment to his thorax, and he recovered. A third dog run over across the loins only exhibited soreness for a day or two. A Scottish terrier run over by a lorry was brought to me passing blood in his urine. Gave him a chloretone capsule followed by doses of hazeline and kept him on milk diet only, and he made a good recovery in a week.

A cat fell into a bucket of whitewash, which was sponged off with warm water immediately after it occurred, and after a few days discomfort he got all right. The same cat was run over by the wheel of my trap, which went right over him, and beyond stiffness for a day or two he showed nothing abnormal. A fox terrier fell into a bucket of whitewash; nothing was done, and I was called in to see him three days after the accident. His hind legs and genitals were excoriated and inflamed, his anus was severely burnt and he had evidently taken a quantity of lime internally. I sponged him and dressed him with boric ointment. He lived about a week and then died. Early removal of whitewash by sponging off with warm water is indicated in these cases.

PROLAPSE OF THE RECTUM IN A DOG.

By G. MAYALL, M.R.C.V.S.
Bolton.

On May 1 an Aberdeen terrier (an old patient here) was brought in at 11 o'clock at night with his rectum out about 5 in. After bathing with cold water I effected reduction and gave a chloretone capsule and an injection of equal part of hazeline and cold water. He went on all right on a milk diet until June 4 when he again everted his bowel. I returned it and gave him injections of hazeline and cold water twice daily for six days. During this time he passed large quantities of matted hair of the colour and length of his own coat, and was fed on barley water and milk. On June 10 his fæces were quite normal and passed without the usual straining visible heretofore. As internal medicine he had a chloretone capsule daily. He was discharged cured on June 10, and as he lives quite close to I have observed him many times since, and he seems quite comfortable and happy.

PYÆMIA IN A DOG.

By GEO. H. WOOLDRIDGE, F.R.C.V.S.
Professor in the Royal Veterinary College, London.

On June 12, a five months' old Irish terrier was brought to the College Clinique for treatment for a swollen throat and head. On examination the sub-parotideal lymphatic glands of both sides were found to be very swollen, and the subcutaneous tissues of the head were œdematous, giving quite a curious appearance. One gland showed a fluctuating protrusion about the size of the point of the finger. It was lanced and a quantity of creamy pus was evacuated. The puppy was off his feed and the bowels irregular with a tendency to diarrhœa. I prescribed massage and local fomentation with chinosol solutions, and internally bismuth carb. salol and tannoform in suspension with Emuls. petrol, and Ext. malti liquidus. The dog was treated as an out-patient.

He was brought back again a week later and presented a very miserable spectacle. He was able to retain a very little liquid food, egg and milk, and beef juice. He was very thin and weak and the superficial abscesses had become very numerous

and almost all bilateral. They were situated one in each prescapular region, one in each axilla, one in each groin, one behind each thigh, one on each side of the base of the tail, one on each side of the dorsal vertebræ; the only single ones being one on the poll and one on the left angle of the haunch. Most of them had burst and discharged creamy pus. The œdema of the head had subsided.

The local treatment with chinosol 1-500 was continued and the same medicine *per os* with the addition of Tr. nucis vom. m.i. three times daily. Nuclein solution, as supplied by Parke, Davis and Co., was also injected subcutaneously in dose of 2 cc., and the patient allowed home to be nursed. From that point the improvement was very manifest. The patient became brighter and took his limited nourishment, to which virol was added, quite readily. The abscess cavities gradually ceased discharging and no new abscesses developed. On being brought again a week later the improvement was most manifest. The patient was very bright and lively and had put on considerable condition. The abscesses had all ceased discharging and had practically healed, a scar showing their former position. A further dose of nuclein was injected, a course of tonics prescribed, and the patient was discharged.

Remarks on the Use of Nuclein.—In this case the commencement of recovery was obviously coincidental with the administration of the nuclein, and I have no hesitation in attributing the success of the case largely to its assistance. I have now used nuclein in canine practice in a very large number of cases, and regard it as a very valuable adjuvant to our other medicinal agents. I recommend it in most catarrhal affections, whether contagious or not, to be used not as a substitute for other lines of treatment, but in addition to them. Moreover, I have had far better results when given hypodermically than when given *per os*.

Abstracts.

SOME CONSIDERATIONS ON THE ABSORPTION AND EXCRETION OF DRUGS.*

By Professor W. E. Dixon, M.A., M.D., F.R.S.

Professor of Materia Medica and Pharmacology, King's College; Lecturer on Pharmacology, Cambridge University; Examiner in Pharmacology and Materia Medica, London University; Examiner in Pharmacology, Cambridge University.

There is no subject in pharmacology upon which our knowledge is more limited than that which deals with the absorption and excretion of drugs. Why is it that chlorides should be absorbed so readily from the alimentary canal, whilst sulphates are refused admission into the body? The answer is at present unknown, yet in many instances it is just such facts as these which are at the basis of the action of drugs. It is permissible to prescribe the sulphate of iron quite freely by the mouth, because it is known that only a trace of what is administered will be absorbed; indeed, were it all absorbed there would not be so much difference between the specific toxicity of this substance and corrosive sublimate. Or, to take another example, were one-tenth part of the usual dose of Epsom salts absorbed into the system severe cardiac symptoms would result.

A great many drugs are given on the assumption that they are not absorbed, and with the object of producing local and reflex effects, yet in these instances, if absorption should occur, evil effects must ensue. The vegetable purgatives afford an example; they contain irritant principles which excite the alimentary canal and induce reflex peristalsis; if for some unusual cause they are absorbed they give rise to renal symptoms and sometimes to nephritis. It is for this reason, among others, that it is advisable to prescribe these drugs in the impure state—that is, with their natural gums and resins—since contamination with such bodies is well recognized as delaying absorption. Extract of aloes is much less likely to be absorbed than aloin, and it is for the same reason that the new synthetical purgatives derived from anthraquinone, and which contain the same chemical nucleus as the active ingredients in rhubarb, senna, aloes, and cascara, are a failure. The pure substance is liable to become absorbed, and, in addition to purgation, backache, pain, albuminuria, and other renal symptoms are liable to occur. Anthelmintics and emetics, also, are drugs deliberately chosen for their local action, and not for specific effects after absorption. Many of our best expectorants act in this way; ammonium carbonate, ipecacuanha, senega, and quillaia will serve as examples; they, of course, increase the flow of bronchial mucus by exciting the nerve endings in the stomach and so affecting the bronchioles reflexly through the medulla.

* From *The Practitioner.*

If it is desirable that the whole of a dose of some drug shall be absorbed into the system, one plan is to inject subcutaneously, and it is not, as has been stated, a matter of indifference as to where the injection is made. Much evidence has accummulated to show in these cases that the drug diffuses from the seat of inoculation through the tissues much in the same way as rings on a pond form as the result of disturbance. The subcutaneous injection of a local anæsthetic such as cocaine shows this perfectly; the anæsthesia, profound at the seat of injection, gradually fades as the distance from this point increases. So that an injected drug produces a pronounced effect on the tissues in the neighbourhood of inoculation as the result of diffusion, and a much smaller effect on distant tissues, since the drug will only reach these through the circulation after absorption.

If strychnine, which acts upon the retinal nerve cells of the eye, be injected (1/30 gr.) into the temporal region of a man, the eye on that side is affected; the field of vision, especially for blue, is enlarged and the acuity of vision is increased, but the opposite eye is hardly influenced. This effect must be due to direct diffusion of the drug to the eye, as if it reached the eye through the circulation both eyes would be equally affected. It would, of course, be of no use to inject morphine locally into a tissue to relieve a localized pain, since the seat of action of morphine is on the sensory cells in the brain; the local application of morphine in all such cases is based on fallacy and is useless. It is not, therefore, a matter of indifference where a drug shall be injected when it is desired to induce a specific effect. Even when only rapid general absorption is aimed at, with the object, let us suppose, of acting on the circulatory system, the seat of injection is still important. One example will suffice to make this clear. Tyramine is the principal active constituent of the liquid extract of ergot; this amine, when injected into the left forearm of a man (dose 30 mgr.), raised the blood-pressure from 122 to 128 mm. of mercury; but the same dose injected round the cellular tissue in the region of the clavicle on another occasion raised the blood-pressure from 122 to 138 mm. It would appear then to be rational to inject our drug under that portion of the skin as near as possible to the organ or tissue upon which it is desired to act, and where a rapid action is desired to choose some loose cellular tissue.

Many drugs are quite ineffective in their action when taken by the mouth. Calcium salts are only absorbed in healthy people with difficulty and very slowly, so that the calcium content of the blood is hardly altered by taking chalk, calcium lactate, or any other calcium salt by the mouth. Potash and ammonium salts also fail to exhibit their specific actions when administered orally, in spite of the fact that they are very readily taken up into the system. It is well known that potassium in excess is a profound poison to all living tissue, and that ammonium salts in the blood cause convulsions by acting on the medulla. Nevertheless, these drugs may be taken, for all practical purposes, in unlimited amounts without causing these effects. The amount of potash salts taken

daily by the vegetarian far exceeds anything ever prescribed by the physician. Potassium and ammonium salts owe this absence of toxicity to their property of easy excretion; the rate of excretion can exceed that of absorption, so that the amount of the drug in the tissues is not perceptibly increased by the oral administration. The specific effects of these drugs can, however, be obtained by injecting them when the rate of absorption exceeds that of excretion.

Adrenalin is another drug which exerts only a local action. If it is taken by the mouth it constricts blood-vessels locally in the alimentary canal and during the process is destroyed. When injected subcutaneously the same effect occurs, and a large patch of white skin is induced, but the specific effect of the drug on the heart and other viscera is not generally present because the adrenalin is oxidized before it can be absorbed.

With some drugs considerable delay occurs even after absorption before the desired specific action is obtained. This applies to digitalis and colchicum. Digitalis, after absorption, is slowly taken up by the muscular tissue, especially that of the heart, and it is not perhaps, till several hours have passed since the introduction of the first dose of digitalis that the patient is under the maximum influence of that dose of the drug. It is for this reason that the treatment of pneumonia by cardiac tonics is commenced early, so that, should the heart commence to fail, it may be already under the influence of the drug. Squill possesses many advantages over digitalis as a cardiac tonic, but as usually administered by the mouth a smaller proportion of it is absorbed, and, further, it is somewhat more irritant, so that it has come to be employed almost entirely as an expectorant.

Before leaving this question of absorption it may be pointed out that some drugs, such as the local anæsthetics, are injected subcutaneously for their local action. It is obvious that these drugs should possess (1) a low degree of toxicity in proportion to their anæsthetic power; (2) solubility in water, besides being capable of sterilization by boiling; (3) non-irritant properties; and that they should be capable of (4) combination with adrenalin. One object of the last axiom is that absorption by the general circulation may be delayed whilst diffusion into the surrounding tissues shall remain normal. Other things being the same, a drug which is absorbed more slowly into the general circulation after hypodermic injection possesses distinct advantages over the more quickly absorbed drug.

Widely different experiments, performed both in Germany and in this country, have shown that two of the best drugs at present available which best answer the conditions enumerated are novocaine and stovaine, and both are largely substituted for cocaine. Novocaine is less toxic and less irritant than stovaine, but, weight for weight, it has not such marked anæsthetic properties. Nevertheless, the specific action of stovaine on nerve fibres is less than that of novocaine, since stovaine destroys other tissues besides nerve fibres.

Even when the rate of absorption of a drug from the alimen-

tary canal is well known, we are still not in a position to state the amount of specific action it will exert, since degree of specific action depends largely upon the amount present in the blood at any one time, and, as has been pointed out, potash and ammonium salts are excreted so rapidly in the urine that their specific effects are wanting. Other substances may be destroyed or altered in the body so as to lose their specific effect. For example, half an ounce of alcohol taken by the mouth, suitably diluted, has no specific action in the body, since it is oxidized completely before sufficient can accumulate in the tissues to exert an effect. The same dose, however, injected under the skin would affect the central nervous system for such time until its oxidation was effected.

Salicylic acid, as is well known, combines in the body with glycocoll, and this renders it inactive; the resulting salicyluric acid is almost non-toxic, and patients suffering from acute rheumatism treated with this body derive no benefit. Derivatives of benzene formed in the alimentary canal as the result of putrefaction are absorbed and excreted in the urine combined with sulphates, which combination greatly facilitates their excretion in the urine, and probably in this way diminishes their toxicity. Nearly all mammals, except man, convert their relatively insoluble uric acid into the much more soluble body allantoin. Man unfortunately does not, and so this non-toxic, though relatively insoluble, substance, uric acid, has been credited with causing every imaginable evil.

A group of drugs which has attracted a great deal of attention in modern times is the organic compounds of the metals. Those of iron and arsenic are perhaps the most important members, and these are given with the object of being absorbed. The organic compounds of iron possess certain advantages over the inorganic; they are not astringent; that is, they have no power of precipitating proteins in the alimentary canal, and therefore do not upset digestion to the same extent as the soluble inorganic bodies. But it must be remembered that the combinations of iron with protein, such as the ferratin of Schmiedeberg, or one of the products prepared from blood, require to be digested before the iron they contain can be absorbed. Furthermore, experimental therapeutic investigations have shown quite clearly that patients suffering from chlorosis improve, as regards the percentage of hæmoglobin in the blood, quicker when they are taking one of the ferrous carbonate preparations than one of these organic preparations. In this connection it must be noted that chlorosis is iron starvation. Iron is not being absorbed from the alimentary canal; whether this is due to sulphides, as suggested by Bunge, or to other causes, is a matter of some importance, for if chlorosis is caused by sulphide, then iron salts act in two ways; they remove sulphide from the bowel by forming the insoluble ferrous sulphide, and they provide an excess of iron for absorption.

The organic preparations of iron placed on the market up to now have proved inferior to the inorganic preparations, when

comparing the rates at which the two groups possess the power of increasing hæmoglobin formation. With regard to the organic preparations of arsenic, however, the tale is different, since, unlike the iron compounds, they are readily absorbed. These compounds, so long as they retain the molecular form—that is, so long as the arsenic forms an integral part of the molecule—are non-poisonous in so far as arsenical action is concerned.

The fact of combining arsenic in an organic compound with a carbon atom is to deprive the compound of arsenical action. This is more commonly expressed by saying that arsenical action depends upon the presence of AsO_3 or AsO_4 ions, and unless these can be liberated in solution from a compound, that compound must be without arsenical action. If, for example, arsenic were combined with an aniline derivative, the new body, acting as a whole, would possess an aniline action, but not an arsenical action, since in solution arsenic ions are not set free. It is necessary, therefore, to consider how it comes about that these bodies should have assumed so important a *rôle* in modern therapeutics and how they produce an arsenical action. The cacodylates are perhaps the simplest of these bodies $(CH_3)_2AsOOH$. They are almost non-poisonous, and pass, for the most part, through the body unchanged; a small percentage, however, is oxidized, and from this the arsenic is set free in ionic form; so that, if such a drug be taken for some weeks, this trace of arsenic exerts a mild arsenical action. Atoxyl is an aniline derivative which contains about 24 per cent. of arsenic, and yet it possesses only about one-fortieth the toxicity of arsenious acid. It has been used largely in the treatment of syphilis, sleeping sickness, and other protozoal diseases, but has now almost ceased to be used on account of its poisonous action on the sense organs and kidneys. The greater part of this substance after absorption is excreted in the urine unchanged, but a small amount is undoubtedly broken up in the body, and this oxidized portion would liberate its arsenic, which should then be free to act in the ordinary way.

The last of these bodies, dioxy-diamido-arseno-benzol, the latest specific of Ehrlich, is alleged to exert an even more powerful specific action on the organisms of syphilis, relapsing fever, and other diseases than the atoxyl group of drugs, and to be less poisonous than these.

Now all these amido-arseno-benzol derivatives, in so far as they are not broken up in the body, exert an action like the members of the coal-tar series, such as amido-phenol; but a portion of each dose is oxidized in the body and the arsenic of this portion is free to exert its specific effect. Yet a mixture of arsenious acid with a suitable coal-tar derivative administered to patients is far behind such a drug as atoxyl in curative power in syphilis, trypanosomiasis, or other protozoal diseases. Only one explanation appears to meet these facts, and, to make clear the extraordinary toxic action these bodies exert on parasites—namely, that the parasites, directly or indirectly, are enabled to break down the molecule, and so to liberate the arsenic in ionic

form and the benzine derivative respectively. The ionic arsenic being set free in the neighbourhood of the organism in a relative degree of concentration, and being very toxic to protozoa, is enabled to destroy them.

If this be the correct explanation of the mode of action of such bodies, it affords us every hope for the future treatment of all diseases caused by organisms. Mercury, for example, destroys most living organisms, but it cannot be employed to destroy living organisms in the body, since, after absorption, it destroys the tissues of the body before the organisms, or, in other words, the organisms are more resistant than the tissues. If, however, the mercury could be combined with some organic body, which would, of course, render it non-poisonous, and if this compound were of such a nature that it could be split up by organisms, cocci, bacteria, and the like, so as to liberate the mercury locally in relative concentration, a chance would then certainly be afforded of destroying active disease by means of drugs given in medicinal doses.

When a drug exerting a well-defined action has been absorbed into the system, conditions may arise which modify or influence the degree of its action. To illustrate this, reference will be made to the drugs which are commonly employed to exert an antiseptic action on the genito-urinary system. The degree of acidity of the urine exerts a considerable effect both on the growth of organisms in urine and on the power of action of antiseptic drugs. Acidity exerts a restraining influence on the growth of organisms in proportion to its degree. But *Staphylococci* and *Bacillus coli* will grow readily in all degrees of acidity which it is possible to produce in man by artificial means.

The normal acid of the urine is the acid sodium phosphate, NaH_2PO_4, and by the administration of this salt by the mouth it is possible to convert an alkaline urine into an acid urine, and to double or treble the degree of acidity of an average acid urine. The condition of the urine is of paramount importance during the administration of urotropin. If urotropin be given to a patient whose urine is alkaline or neutral it exerts no particular effect, and as a genito-urinary antiseptic is valueless. If, however, it be administered to a patient with an acid urine, a small proportion of the drug, varying with the degree of acidity, is converted to formic aldehyde, which may be detected in the urine, and which is one of the most powerful of all known antiseptics. The effect of this drug is well shown by the fact that an acid urine obtained from a patient taking urotropin may be kept almost indefinitely without undergoing ammoniacal fermentation. The significance of this hardly requires to be pointed out, but it may be desirable in infective diseases of the genito-urinary tract to obtain first an acid urine and then employ urotropine.

Of the other urinary antiseptics brief reference may be made to the two main groups—the coal-tar series of drugs and the group of essential oils. Salicylic acid may be taken to represent the former. When given by the mouth it has quite a definite action in inhibiting the growth of organisms in the genito-urinary

tract; it prevents the growth of all organisms in much the same degree without exerting any specific action on one or the other, but its action is very feeble compared with urotropin in an acid urine. Moreover, about 50 per cent. of the salicylate excreted in the urine is rendered inactive by conversion into salicyluric acid.

The essential oils, of which the oils of copaiva, cubebs or sandal-wood are most used, since they are less irritant, and therefore can be given in larger doses than most others, act unequally on different organisms; they are quite feeble against putrefactive organisms or *Bacillus coli*, but against *Staphylococci* they exert quite a powerful antiseptic action.

In conclusion, it may be pointed out that the rate of absorption of drugs from the alimentary canal may be influenced by the administration of other substances, either previously or simultaneously. One example will suffice. Alcohol is not only absorbed with great rapidity itself from the stomach and intestines, but it facilitates the absorption of other substances dissolved in it. This naturally leads one to speculate whether this action of alcohol may not account for some of the toxic effects associated with indulgence. One fact is clear: that alcohol is not the direct cause of the various cirrhoses which are commonly associated with alcoholics. But may it not be that in a proportion of these people poisonous products are formed in the alimentary canal as a result of putrefaction, and that the presence of alcohol brings about their absorption? Whether this explanation be correct or not, one such poisonous product is formed in the alimentary canal of man under certain conditions and its injection into animals leads to cirrhoses.

THE PREPARATION OF ANTI-RINDERPEST SERUM BY MEANS OTHER THAN THE INJECTION OF VIRULENT BLOOD.*

By Major F. S. H. Baldrey, F.R.C.V.S., D.V.H., I.C.V.D.

The excessive cost in the production of anti-rinderpest serum on account of the animals necessary for "controls" led to the method of augmenting the amount of virulent material by means of "peritoneal washings" or "peritoneal fluid," as it is called in Muktesar. Workers in the Manila Laboratories of the Philippine Islands were the first to inaugurate this system. The method has been adopted here, but some of the testings of serum so prepared gave irregular results and led to the following experiments to definitely decide as to its value.

The technique of preparation is comparatively simple and short as follows:—(For fuller particulars read Ruediger, *Philippine Journal of Science*, vol. iii, No. 5.)

*Reprinted from the *Journal of Tropical Veterinary Science*, vol. vi, Part I.

Control animals which are to be bled for providing inoculable material are injected into the peritoneal cavity with varying quantities of a .5 per cent. sterile solution of citrate of potash at a temperature of about 27° C. This operation is performed one hour before bleeding the animal to death. The injection being made in the flank and the quantity of fluid depending upon the weight of the animal. The weight of hill animals varies from 100-200 lb., and the amounts injected are from 1,000-2,000 c.c. of potash citrate solution. The fluid is collected from the peritoneal cavity immediately after the death of the animal. Every precaution is taken to ensure absolute sterility throughout the operation. The amount of fluid recovered is about 50 per cent. of what is injected.

The theory is that the fluid so obtained is as virulent as blood, and experiment has shown that a very small quantity is capable of reproducing the disease in susceptible bovines. The amount of defibrinated blood obtained from one of the above-mentioned controls is 1,200-2,000 c.c., and the amount of peritoneal fluid from 800-1,400 c.c.; it is therefore seen that the material for hyperimmunizing purposes is increased to more than 50 per cent. without any increased expenditure in animals.

The advantage of the method is evident; it is, however, necessary that the serum produced by hyperimmunization with this fluid should be as potent as possible in order to minimize the amount of the dose necessary for protective purposes, especially as susceptible animals such as hill, plateau, the cross-bred European and Australian stock require many times the protective dose necessary for ordinary indigenous plains cattle.

The following observations were made to test the power of serum produced from the injection of peritoneal fluid as compared with that produced from the inoculation of virulent blood only.

Plains animals are much less susceptible than hill cattle and produce a serum of less potency. The experiment was therefore divided into two series, viz.: (*a*) the comparison of plains serum made from blood injections as against that made from peritoneal fluid injections in these animals; (*b*) hill serum made from blood inoculations as against hill serum made from peritoneal fluid injections.

Charts 1 and 2 show the method employed in the serum preparation by means of the inoculation of virulent rinderpest blood into immunized plains and hill cattle.

Charts 3 and 4 show the method employed for the preparation of the serum by peritoneal fluid inoculations in plains and hills.

It has been found in this laboratory that the inoculation of doses of peritoneal fluid cannot be increased to the extent of blood doses. It has apparently a much more toxic effect and deaths have taken place as a result of it within two to three days with all the appearances of acute toxæmia. (Plate I shows the *post-mortem* appearance of the fourth stomach of a bull which died on the third day after inoculation.) Moreover, animals do not absorb the material so well and sloughing of the skin and

abscesses are not infrequent from its use. It has been noticed that an acute inflammation sometimes follows, resulting in a dry gangrenous condition of the skin which eventually peels off as a hard scale, occasionally necessitating the destruction of the animal.

These results are not apparent unless very large doses, *i.e.*, 3,000-5,000 c.c., are given. With the same quantity of blood no such result is seen. It is not caused by the material being septic as frequent examinations have shown that the fluid is sterile, with the exception of rinderpest. Chart 5 shows the result of peritoneal fluid injection, in which death took place on the second day. There were gangrenous areas at the seat of inoculation and the animal presented the toxic *post-mortem* appearances described above. Many similar results have been obtained and the *post-mortem* appearances are always identical.

It was therefore considered inadvisable to use more than the dose indicated on the charts for the peritoneal inoculations. Although these doses are somewhat less than those of blood, they are as much as can be given to ensure absolute safety in their administration. The *post-mortem* appearance in Plate I, showing the acute inflammatory condition, is very characteristic and always seen. Chart 5 shows the course of injection in an animal so inoculated. As death took place on the second day with the toxic *post-mortem* symptoms above mentioned—rinderpest *per se* could not have been the reason, and the conclusion is that a toxæmia is the cause of death. Plains animals are much more susceptible to this toxic influence than hill cattle. It is known that plains animals are less susceptible to rinderpest than the hill, and this may account for their greater susceptibility to the toxin. The results obtained in the Philippines with peritoneal fluid are much better than ours, and this may be accounted for by the same reason, *i.e.*, that all their cattle are apparently as susceptible as our hill animals.

In both cases the rapid method of making serum is adopted, *i.e.*, plains animals only one hyperimmunizing dose, and for hills two hyperimmunizing doses. Serums prepared by the above methods were tested as follows:—

The doses are arranged on a plains animals basis; *i.e.*, so many c.c. per 600 lb. of body weight. Lingard has shown that hill animals require 18 times the dose necessary for plains animals, and as these latter are invariably susceptible, they were used for the test. Doses of 2, 4, 6 and 8 c.c. per 600 lb. were used to test the serum produced from hill animals, and doses of 6, 8, 10, and 12 c.c. per 600 lb. for serum prepared from plains animals. The doses were so arranged because the serum of plains is weaker than hills. In each case the amount of the test dose is multiplied 18 times because it is for hill animals and doses given in exact proportion as to weight in the ratio of 5 c.c. per 600 lb.

The following schedule shows the result in a tabulated form:—

Each of the above tests was done in two animals, but I only give one typical chart of each reaction:

	Doses of serum	8 cc. reaction	10 cc. reaction	12 cc. reaction	15 cc. reaction
Serum prepared by the injection of V. B.	With V. B. Plains.	Both mild reaction	Both very mild reaction	Both very mild reaction	No reaction
Serum prepared by the injection of peritoneal fluid	With P. F. Plains.	One death, one severe reaction	Both severe reaction	One death, one severe reaction	Both mild reaction

Result.—Virulent blood is a 10 c.c. serum.
Peritoneal fluid is a 15 c.c. serum.

(*a*) Therefore serum prepared from plains animals by the hyperimmunizing with virulent blood is 33·3 per cent. better than that prepared by hyperimmunizing with injections of peritoneal fluid.

	Doses of serum	4 cc. reaction	6 cc. reaction	8 cc. reaction	10 cc. reaction
Serum prepared by the injection of V. B.	With V. B. Hill	Slight reaction	Both slight reaction	Both very slight reaction	Very mild reaction
Serum prepared by the injection of peritoneal fluid	With P. F. Hill	Death	Both dead	One death, one severe reaction	Very mild reaction

Result.—Virulent blood is a 5 c.c. serum.
Peritoneal fluid is a 10 c.c. serum.

(b) Therefore serum prepared from hill animals by the hyperimmunizing with virulent blood is 50 per cent. better than that prepared by hyperimmunizing with injections of peritoneal fluid.

(*c*) Serum from plains and hills in equal parts and made by blood injections is depreciated 42 per cent. by the addition of an equal part of serum made by the method of hyperimmunizing with peritoneal fluid.

Although the above results show a depreciation in the value of the serum, it in no way detracts from the practical utility of the method, in fact, it enormously increases the inoculable material, and I may say that, but for its application the laboratory would this year have been unable to turn out anything like the quantity of serum it has done, on account of the shortage in the supply of hill animals for control purposes. It will be seen that the power of serum produced from plains animals by the inoculation of peritoneal fluid is less deteriorated in comparison to the blood method in similar animals than is the serum from hill animals prepared in the same way and compared with the blood method in hill animals. This accentuates the conclusion that the serum of rinderpest is an anti-toxic material and not entirely anti-bacterial. It has

already been noted that plains are much less susceptible than hills, and yet from a material which is evidently more toxic than blood they produce a better serum, in comparison, than do the more susceptible hill cattle.

It is generally recognized that the more susceptible an animal is to bacterial influence, the less susceptible it is to the toxin of that bacteria, and *vice versâ*. This appears to me strong evidence in favour of the above conclusion that anti-rinderpest serum is an anti-toxin. Experiments have been commenced on these lines and the result of the investigation will form the subject-matter of another paper.

Conclusions.—That the method of employing peritoneal washings to augment the amount of inoculable virulent material is a good one.

(2) It produces an anti-rinderpest serum of a high value, but less potent than that produced by blood inoculation.

(3) In comparison with serum from blood inoculations it is of greater value in the less susceptible plains animals than in the highly susceptible hill cattle.

(4) That its reaction is produced principally by a toxin which is rapidly formed under the vital influence of the peritoneal cavity.

(5) The inoculation of very large doses is not advisable in Indian cattle on account of the danger of death from toxæmia, the inability of the animals to absorb it subcutaneously, and the extreme caustic action it has upon the tissues.

(6) The method in the doses above described and which are small in comparison to the massive blood injections is valuable in that a good serum is produced.

(7) Further experiments in diluting the fluid or mixing with blood may demonstrate improvements on the system as at present practised.

[In the original, numerous charts are included showing the testing of the serum of animals prepared by both methods, and also a beautiful coloured plate showing the *post-mortem* appearances of the mucous membrane of the fourth stomach of a bull dead from the effects of a subcutaneous inoculation of peritoneal fluid.]

Review.

MEAT AND FOOD INSPECTORS' EXAMINATIONS: MODEL ANSWERS TO QUESTIONS SET BY THE ROYAL SANITARY INSTITUTE AND OTHER EXAMINING BODIES. Compiled by G. T. Billing, Meat Inspector, Finsbury, and A. H. Walker, Sanitary Inspector, St. Pancras. Pp. 156. Published by the Sanitary Publishing Co., Ltd., London, 1911. Price, 3s. 6d.

The object of this little book, as set out in the preface, is to familiarize candidates with the type of questions set by sanitary and other bodies examining for certificate for meat and food inspectors. One hundred and fifty questions have been

selected from various examination papers and arranged under headings dealing with the many and varied subjects. The headings amongst others include the following: Slaughtering; Cowsheds; Signs of Disease and Health in Living Animals; General Diseases of Animals, Fowls, and Fish; Organs in Health and Disease; Parasites and Parasitic Diseases; Bacterial Diseases; Butter, Milk, and Cheese; Eggs, Coffee, Flour, &c.; Lime-juice, Beer, and Porter; Shell-fish and Canned Foods; Law; &c.

It will thus be seen that there is a very wide range of questions to be considered. The authors have attempted to answer the various questions, and they call them "model answers." We have thus an opportunity of criticizing both questions and answers. With regard to the former, we consider that while most of the questions may be regarded as quite suitable for the candidates for the object in view, yet others strike us as being open to strong objection even on the part of the candidates. For example, take the following question: "Name the diseases that occur in animals used for food, and state briefly how they may be recognized while the animal is alive." We consider that any man setting such a question is quite unfit to be an examiner. It is utterly impossible for any candidate to answer such a question in the total amount of time allotted for the whole paper, viz., two hours. It would be more likely to take two days. The authors, however, do not shirk it and make a valiant attempt to answer it, and obviously most inadequately, in a page and two-thirds. Here is another question with a portion of the model answer. (*Q.*) What is tuberculin and how is it used? (*A.*) Tuberculin is a 40 to 50 per cent. glycerine solution of a pure cultivation of the tubercle bacillus. . . . The best position for inoculation is the side of the neck or shoulder, for here the swelling can best be observed." What swelling, we ask? But surely such questions are improper for such candidates. It requires a long course of professional training before such things can be properly understood. How then can lay meat inspectors be reasonably expected to answer them? We cannot therefore commend the book for its model answers as a whole, though undoubtedly many answers are excellent and models of conciseness. But as a guide to the type of questions likely to be met with in meat and food inspectors' examinations we welcome it. From that point of view it will be found very serviceable to future candidates.

VET.-MAJOR BARRY, F.R.C.V.S., 2nd Life Guards, was called to the Bar on June 28. The Duke of Connaught was present at the time especially to congratulate Major Barry, and was one of his sponsors. We believe Major Barry is the first officer of the Guards to be called to the Bar while still on the active list and we very heartily congratulate him.

Miscellaneous.

MR. AINSWORTH WILSON, F.R.C.V.S.

THE NEWLY-APPOINTED PROFESSOR OF VETERINARY SURGERY AND OBSTETRICS AT THE ROYAL (DICK) VETERINARY COLLEGE, EDINBURGH.

WE feel that we can unhesitatingly congratulate both The Royal (Dick) Veterinary College and Mr. Ainsworth Wilson on the latter's appointment. From the point of view alike of academic attainments, practical experience, and scientific zeal, Mr. Ainsworth Wilson's appointment is an altogether admirable one. Mr. Wilson is an old student of The Royal (Dick) Veterinary College, whence he qualified as a member of The Royal College of Veterinary Surgeons in May 1894. He holds silver medals for Cattle Pathology and Meat Inspection, for Veterinary Medicine and Hygiene, and for Materia Medica. In 1894 Mr. Wilson went to India to take up the appointment as Inspector of Contagious Diseases for the City and Port of Bombay under Veterinary-Major Mills, a position which he held for nearly four years. In 1898 he returned to Europe and held successively, or concurrently, the Inspectorship under the Contagious Diseases (Animals) Act for the Blairgowrie district, the Inspectorship under The Public Health Act for East Perthshire, and the Inspectorship under The Contagious Diseases (Animals) Act for the Witham Police Division. Mr. Wilson has also had considerable experience as a lecturer under the County Councils Technical Education Scheme both in Scotland and in England; he has lectured for The Royal Sanitary Institute, and for various other public bodies, including The National Association for the Prevention of Consumption. On tuberculosis in fact he has specialized. Besides general practice in Durham and Newcastle-on-Tyne. While Mr. Wilson was in Bombay he acted as managing assistant to the well-known firm of veterinary surgeons, Messrs. R. Scott & Co. He was for six years in practice in Blairgowrie, and for the last seven years has been conducting a very successful practice in Essex.

Mr. Wilson has many of the qualities which should make him popular as a lecturer at his old college, but valuable as popularity is, we feel convinced that he will bring to his work the still higher attainments which in the teacher enthuse and make clear the path of the student.

Mr. J. Basil Buxton, M.R.C.V.S., D.V.H., has been appointed Lecturer in Veterinary Hygiene and Dietetics. We congratulate him and wish him every success in his new sphere.

Professor A. Wilson, F.R.C.V.S.

ROYAL COLLEGE OF VETERINARY SURGEONS.

Election of Council.

At the sixty-eighth annual meeting of the R.C.V.S., at 10, Red Lion Square, on June 7, 1911, the result of the election of Council was announced as follows:—

Stockman	1,009	Wharam	646
Mettam	980	Burt	573
Barrett	932	Clarkson	453
Lawson	924	Packman	441
McCall	897	Fletcher	346
Bradley	767	Watson	322
Dunstan	721	Grasby	246

There were 17 spoilt papers, and 43 were received too late. As there were 8 vacancies the President (Mr. W. Freeman Barrett), who occupied the chair, declared the first eight to be duly elected.

The only change involved is the inclusion of Dr. Bradley in the place of Mr. Burt. It was to be expected that Dr. Bradley would be elected since his appointment as Principal of the Royal Dick College necessitated his presence as the representative of that institution. It is unfortunate, however, that Mr. Burt should be the member to lose his seat to make way for him. Mr. Burt was one of the most enthusiastic workers on the Council and the committees of which he was a member, being one who regards deeds as being of greater importance than words. We trust he will allow himself to be nominated again next year and that he will regain his seat and be able to continue his excellent work on the Council.

DISEASES AMONGST BEES.

The Board of Agriculture and Fisheries desire to inform bee-keepers in Great Britain that investigations are being carried on by their scientific advisers into the causes and characteristics of the disease among bees which has now broken out in many counties, and which originally made its appearance in the Isle of Wight. The Board would be glad to receive communications from bee-keepers whose bees have been affected by the disease, and who would be willing to supply information likely to be of service in connection with the investigations. A statement of the points upon which it is desired to obtain particulars would be sent on application. Information as to new outbreaks in districts only recently infected is especially desired. In certain cases specimens of diseased bees will be required. Correspondents are therefore requested to say whether they could send bees for examination. Bees should not be sent to the Board until asked for. Communications should be addressed to The Secretary, Board of Agriculture and Fisheries, 4, Whitehall Place, London, S.W.

TWIN OSTRICH CHICKS FROM A SINGLE EGG.

THE interesting event of two ostrich chicks hatched from a single egg has recently occurred at the Ostrich Farm at Mr. Carl Hagenbeck's Zoological Park, Stellingen, near Hamburg, Germany. The egg in question was laid by a Cape hen mated with a Somali cock. At the time the egg was placed in the incubator it was observed to be somewhat larger than the others, and when hatching took place it was found to have produced two ostrich chicks, which were to all appearances absolutely normal. They were, however, attached to one another by a single navel-string or umbilical cord. The veterinary surgeon of the establishment was immediately called and the two were cut apart. They seemed, when separated, to be in every way healthy chicks, exceedingly strong and able to run about, but unfortunately they only lived four days.

As far as can be gathered, this is the first record of two perfect ostrich chicks hatching from a single egg.

Translations.

VAGINITIS GRANULOSA INFECTIOSA SUIS.

BY DR. EMIL HAUPTMANN.

Warnsdorf.

CONTAGIOUS catarrh of the vagina is generally described as a specific infectious disease of cattle. In spite of a thorough overhauling of literature there is nothing to be found indicating that the complaint may affect other animals. Hutyra and Marek in their "Special Pathology and Therapy of the Domestic Animals," state that transference of the complaint to other races of animals has never been accomplished. Only de Bruin relates that he has succeeded in giving the disease to horses, sheep, goats and swine. Against this general statement I will make the following history of observations.

The owner of a large herd of pigs complained that his animals, with which he had had no difficulties for many years, had shown unwelcome changes, and despite all care, he had not been at all successful during the last year, and breeding and rearing had become profitless pursuits.

Some sows had aborted, others had only borne 2 to 4 weakly youngsters that had come to nothing. Old sows which were proved breeding animals and had previously brought forth 10 to 12 of a litter as well as young sows, were similarly affected. In spite of trying a third boar the position remained unchanged, and he had been obliged to slaughter several sows. The sows were very restless and always on the move, so that they fell away a good deal in condition. My first question was whether the owner knew anything about contagious vaginal catarrh of cattle and

whether his own herd of cows had ever suffered from the complaint.

He replied that he knew it only too well, and that he had had two years' experience of it with resultant losses as regards cows, calves and milk.

After this news the sows were examined without any difficulty, as they stood quietly during the procedure. A very interesting condition was revealed. The vulva showed nothing remarkable at first, but was swollen, and the lower angle soiled with secretion. On opening the lips nodules were immediately visible, larger than those seen in cattle and more raised, because the mucous membrane of the vagina is flatter than in cattle and almost porcelain-like in colour. It was neither yellow nor red, but the blood-vessels were prominent and tortuous and all one colour, as one sees in calves and calvers.

The enlarged follicles were not arranged rank-wise but visibly scattered about, in some animals thickly and in others sparsely, but the upper vault was less affected than the under one. The colour of the prominent nodules was red or yellow. Almost all the sows showed the same symptoms, but in the boars as in bulls no characteristic appearance could be noticed. The secretion from the vaginas was microscopically examined, and streptococci similar to those seen in cows were found. After this, treatment similar to that practised in affected cattle was undertaken and repeated disinfection of the sties performed.

The employment of bacillol capsules and ointment soon effected complete cure with disappearance of all difficulty in breeding and its dangerous sequelæ.

From this account it may be concluded that there was transference of the complaint from the cows to the pigs.

I have noticed the same condition arise in swine in a second case where diseased cattle and swine were both housed under one roof, and the cows had suffered severely from abortion and sterility. Due precautions should be taken where affected cows and swine inhabit a homestead, and the owner should be warned.

(*Tierärztliches Zentralblätt.*)

A CASE OF UTERINE TORSION IN THE MARE.

By M. REGNIER, Veterinaire à Corbigny.

Nièvre.

I was sent for on March 3, at 7 o'clock in the evening, to see a mare in an advanced state of gestation, which was put in the meadow the preceding day and was found in the evening in a ploughed field lying on its left side in a furrow (the furrow was like a big ditch separating two ploughed areas) and unable to rise. The owner told me that after being got up and taken to the stable she showed violent colic, in the course of which she tried hard to urinate. Further, she refused all food and voided hard dung balls covered with whitish mucus.

Temperature normal, ocular mucosa a livid brown tint. Although the mare was a month from the termination of gestation the vulva was tumefied and open. One could not detect a fœtus either on the right or left side.

I immediately practised vaginal and rectal exploration. The bladder was completely empty, to the great astonishment of the owner. The hand passed to the neck of the uterus without effort and without encountering any abnormal folding. The fingers introduced into the cervical orifice were met by an insurmountable obstacle. However, the neck was dilated to ascertain extent (I introduced four fingers into it) and deviated in an upward direction.

Rectal exploration rapidly established diagnosis. The rectum contained some dung balls. The hand having penetrated into the abdominal cavity passed between two spiroidal cushions, which one easily recognized as being the broad ligaments violently stretched and folded in the form of a veritable cord. The right ligament was very easy to explore from its lumbar insertion to the point where it formed a cord in front and above the left ligament. The direction of the folds of this right ligament and the position of the cord in front and above that of the left ligament made one give a probable diagnosis of torsion to the left. Besides the owner told me that from the impressions in the soil the mare had lain down on the left side, had rolled, made a half-turn on her back, and come on to the right side.

The uterus had been submitted to a displacement in the inverse way to the direction of the hands of a watch.

We put off all intervention until the morrow. On March 4 the mare was lying on a bed of straw and inclined in such a way that the anterior part of the body was downhill.

The mare was rolled to the left, at first half a turn, then several successive turns.

Rectal exploration practised after each rotation indicated no change in the position of the gravid uterus and I abandoned treatment. The animal died the same night, the illness having lasted about forty-eight hours.

Autopsy practised twenty-four hours after death gave the following results. The abdominal wall presented at its median line a fissure 80 cm. long, whose edges were inflamed, blackish, and into which the gravid uterus and the point of the cæcum had passed. In the abdominal cavity all the organs were healthy with the exception of the genital organs. The gravid uterus contained a foal of ten months in the right cornua; it had undergone a twist of a turn and a half to the left. The torsion commenced at the neck of the uterus and finished at the base of the cornua. The Fallopian tubes and the ovaries formed two blackish contiguous masses, the size of a fist. The uterine walls were congested and blackish. A collar at the base of the uterus, due to the twist, had cut off nourishment to the genital organs, causing passive congestion and expulsive efforts. Eventration had been caused by these efforts and led to shortening of the duration of the illness.

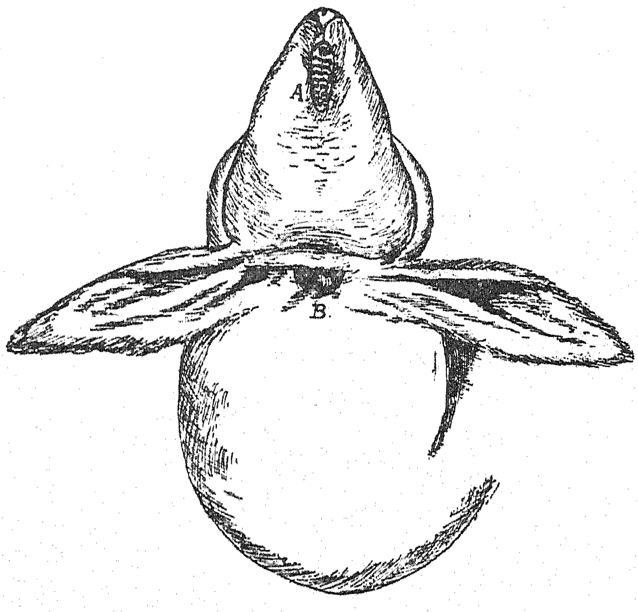
Noticeable points are that torsion of the uterus is possible in the mare in the last stages of pregnancy. Rolling on the back may cause this. Uterine torsion is very anterior; diagnosis is effected by rectal exploration. Here the uterus had twisted a turn and a half. The violence of the twist had immediately led to the colic of abortion. Contrary to what Goubaix believes, the floating colon was not comprised in the twist.

(*Revue Générale de Médecine Vétérinaire.*)

MULTIPLE ANOMALIES IN A LAMB.

By Professor C. GAVRILESCU.

The subject affected with these malformations constitutes a very rare case. A perusal of medical literature and scientific works discloses no such a similar instance. The subject was a lamb born dead at the end of the term. It was a male weighing nearly 8 lb. and over a foot long.



Subject viewed from underneath.

The Exterior.—In the region where the two branches of the inferior maxilla unite, the animal presented an elongated opening extending 2 cm., rounded in front and pointed behind (fig. I A). Through this opening the palate with its transverse grooves could be plainly seen. A stylet introduced from the front to the back in the interior of this opening fell into a cavity and stopped at

a distance of 7 cm. against a hard osseous part, which formed the depth of the cavity. By moving the stylet in several directions and percussing the hard part with it at different points I could find no orifice which permitted the stylet to pass further. This cavity was the animal's mouth. By extending the head on the neck in the cervico-cephalic angle I discovered an opening almost elliptical and extending 2 cm. in its widest diameter (fig. I B). There were no hairs round this opening and at the extremities of its transversal axis the ears originated. Underneath the cervico-cephalic opening the inferior border of the neck presented a cyst of a pasty consistence to touch. Besides the peculiarities named the exterior of the animal presented nothing abnormal.

Dissection.—The buccal cavity was formed by the palate, the cheeks with their odontoids, quite a small part of the tongue, the dental arcades of the upper jaw which were inverted towards each other in such a way that their dental table, instead of being directed downwards as in the normal state, was directed almost horizontally. The inferior wall of the mouth was formed only by skin muscles and mucosa. The inferior maxilla was absent. The mouth was obstructed at the back and its depth corresponded to 1 cm. near the cervico-cephalic opening. The pharyngo-laryngeal apparatus began at the cervico-cephalic opening; a stylet introduced at the œsophagus or trachea only came out at this opening. The nares were normal, but the nasal fossæ stopped at the level of the mouth and did not communicate with the pharynx and larynx. The other organs were normal.

Résumé.—Absence of inferior maxilla; incomplete development of the tongue; interruption of the mouth and nasal fossæ with the pharyngo-laryngeal apparatus; presence of a cervico-cephalic opening; displacement of the ears from their normal situation; presence of a congenital cyst in the inferior cervical region.

(*Arhiva Veterinara.*)

TREATMENT OF VERMINOUS BRONCHO-PNEUMONIA IN YOUNG CATTLE.

By M. PARIS.

The author has treated severe outbreaks of this affection which had decimated the herds in his district by means of Malkmus's spray—creosote 410, alcohol 40, distilled water 40. He has had very good results. He recommends taking the animals up from pasture and housing them in stalls with dry floors. As preventive treatment, avoidance of affected pasture, drainage of damp meadows, pure drinking water (filtered), and copious use of super-phosphate on the affected land.

(*Der Tierarzt.*)

AMPUTATION OF 2.2 METRES OF THE INTESTINE IN PROLAPSUS RECTI OF THE HORSE WITH FAVOURABLE RESULT.

By Veterinary-Surgeon L. J. FABRITIUS.

Abo, Finland.

On April 4, 1909, I had the opportunity of performing the radical operation in a bad case of prolapsus recti of the horse, which, in spite of severe conditions, resulted favourably.

A six-year-old pedigree mare, belonging to Farmer L. in P, had given birth without any help to a dead foal which, according to the owner, had probably come hind end first and perforated the upper vaginal wall with the hind feet, the birth taking place through the rectum. Following the strong straining a prolapsus recti occurred immediately after birth, which at first was of small extent, but in the course of a few days came out and hung down to the hock joints.

The following details show that even under exceptionally unfavourable conditions success is possible if a strong constitution in the patient aids recovery.

On my arrival at 10 o'clock in the evening I found the mare in a weak state with all four legs extended and with the prolapsed intestine necrotic, dark red, and soiled. As if the state of things was not bad enough, the owner and his man were in a drunken condition, so that I was compelled to operate with the help of two half-grown youths. In spite of the very small chance of a successful result I resolved, however, to perform the radical operation, although I was compelled to undertake it in a narrow and dirty box in the middle of the night with an extremely bad light.

After thorough disinfection of the prolapsed piece of intestine with lukewarm aloes solution, I drew it further out until it was possible to insert two sutures at right angles in healthy and uninjured tissue, whereupon I split the intestine on its upper side in the long direction, so that my left hand could be inserted into its lumen. I then put in fourteen sutures of silk in a transverse direction, whereby both serous surfaces of the intestine were brought into contact. Thereafter the intestine was cut off with the scissors about 2 cm. behind the sutures. The edges of the mucous membrane were united with ten button sutures, the rectal sutures were buttoned and cut off, and the intestinal stump pushed back into its place in the pelvic cavity. The place of suture was now in the neighbourhood of the sacrum. The extruded portion of intestine was 220 cm. (about 6 ft. 7 in.) in length! The recto-vaginal fistula was sewn with strong silk sutures, but only provisionally, because the very weak condition of the mare necessitated the operation being curtailed. The owner was given instructions in writing on diet, employment of opium, and bathing, &c.

On April 22 I examined the mare again. The suture intestine

was now completely healed. Two spool-shaped growths at the suture place, which hindered the onward movement of the intestinal contents, were cut off with the scissors. The sutures in the recto-vaginal fistula had torn out, probably because the owner had not observed the dietetic instructions given. The edges of the fistula were freshened with a sharp curette and new sutures put in.

Several months have now elapsed and I have heard nothing further of the patient.

(*Berliner Tierärztliche Wochenschrift.*)

CONCERNING A NEW MICROBE OF HÆMORRHAGIC GASTRO-ENTERITIS OF THE DOG.

BY A. LUCET.

THE mode of infection in hæmorrhagic inflammation of the stomach and intestine of the dog is still obscure. Recent investigations have led to no result. Either those ovoid bacteria known as *pasteurellæ* can assume an etiological *rôle*, or the results of the investigations were of value where the dejecta of sick animals was used to try and reproduce the illness in experimental animals. Further experiments, however, need to be made.

Perhaps Lucet's discovery may lead to a better understanding of the cause of the disease. He experimented with a dog that had a violent sub-acute attack of gastro-enteritis showing well-marked localized lesions. He recorded the case in the *Comptes rendus de l'Academie des sciences*, July 18, 1910. The case was noteworthy in that in the shiny exudate of the cæcum, which was dark red and fatty, a number of microbes of spirillary form were found, and these also occurred in the ileum, colon, rectum and stomach; they were absent wherever the intestine presented a normal appearance, so that the new discovery must have a direct relation to the specific disease.

Some of the spiral-formed micro-organisms were very thin (0.4 microns) and 5 to 10 microns long, and carried two, three, or four segments of loose coils; others appeared shorter, doubled thicker, showed more closed spirals and had little motility. They must not be confounded with those spirillæ found by Regaud in the internal tissue of the mucous membrane of the stomach of dogs and cats in 1909.

These spirochætæ stain badly, not at all with silver, but they take ferruginated hæmotoxylin or diluted Giemsa.

The author only notes the presence of these new microbes and makes it known. He does not know what *rôle* the microbes play, but is investigating the matter further.

(*Deutsche Tierärztliche Wochenschrift*, ex *Revue générale, Toulouse.*)

CONTRIBUTION TO THE PATHOLOGY OF THE THYMUS GLAND.

By M. L. NAUDIN.
Veterinary Surgeon, Orleans.

THE extreme poverty of our literature on this subject encourages me to relate the two following cases from my practice.

(1) I was urgently called to a heifer eight months old, which, while in excellent health, was taken with severe blowing, refused to eat and seemed very ill. On arriving an hour afterwards the animal was dead. Autopsy was at once undertaken. Carcase in a good state, slightly blown up, ocular mucosa slightly injected, subcutaneous connective tissue normal; no lesion in the abdominal organs; the gastric compartments contained food without over-repletion. On opening the thorax 3 or 4 litres of a limpid liquid, light red in colour, flowed from the pleural cavities; the two lungs were the site of an intense and generalized œdema, the perilobular conjunctive tissue was full of limpid serosity of a pale yellowish colour, on inflammatory lesion either in the pleuræ or pericardium; the heart arrested in diastole full of coagulated blood.

The thymus was enormous; it represented a bi-lobed mass 25 centimetres long, 15 wide and 10 thick; incised, it was juicy and filled with a crowd of hæmorrhagic points. In the absence of other lesions necessary to explain the pulmonary œdema which had led up to so sudden a death, I recalled the case of sudden deaths in children which doctors attribute to-day to hypertrophy of the thymus, without the pathogeny of these accidents being elucidated (vascular nervous or tracheal compression of a reflex nature acting on the pneumogastric or vitiation of the internal secretion of the gland).

(2) A mountain dog aged six years was brought to me because he was frequently attacked with a dry intermittent cough. His condition was good, auscultation and percussion revealed nothing. I gave him for some months expectorants, calmatives and iodides without result; finally the attacks became more frequent, difficulty in breathing appearing in the slightest effort at running or gambolling, and emaciation following. I expected tuberculous adenopathy of the tracheo-bronchial glands, and advised slaughter, which was agreed to.

At the autopsy immediately after death the carcase appeared thin and the mucosæ pale, the abdominal cavity showed no lesion. On opening the thorax I was struck by the existence in its anterior part of a whitish ovoid mass with a slight depression running its entire length and dividing it into two equal lobes. Its largest antero-posterior diameter measured 20 centimetres, its smallest 10 c.c.; its consistence was soft and fluctuating; its superior face was traversed by a groove lodging the trachea and œsophagus. The lungs, whose anterior lobes were folded back on each other, were healthy; no exudate in the pleuræ nor pericardium, no glandular lesions.

Incised, this mass, from its situation, form, and connections,

probably the thymus persisting abnormally and considerably hypertrophied, was constituted by a fibrous membrane limiting a closed cavity filled with numerous lobules containing a sort of fluid jelly resembling clotted milk. This stuff included in the mediastinum had evidently played from a pathogenic point of view the same rôle as adenopathies of this region in the production of the accidents heretofore mentioned.

(*Revue Générale de Médecine Vétérinaire.*)

CONTRIBUTION TO THE STUDY OF PERICARDITIS IN THE DOG.

By Professor LANFRANCHI of Modena.

La Clinica Veterinaria.

Pericardites are very rarely recorded in the dog and published observations attribute almost all of them to specific inflammations. This record concerns a Russian grey hound 14 months old, visited on November 16. The owner had only possessed the animal a few months. To combat signs of rickets he had overfed the dog on flesh with the addition of phosphates, and this was successful. For some days there had been a small appetite, increased prostration, and accelerated and difficult respiration (26 to 28 per minute). The conjunctivæ were hyperæmic. The extremities cold; rectal temperature 40·6° F. Heart beat very energetic accompanied by slight vibratory murmurs; pressure over the precordial region caused great pain. Resonance of the thorax was normal save in the cardiac region where the zone of percussion was enlarged. Heart beats 110 per minute were regular; there was a slight mesosystolic friction audible at the level and base of the fifth rib. There was a slight venous jugular pulse.

These signs led to the diagnosis of pericarditis. It was a primitive pericarditis for all the other organs were healthy, but it was most difficult to establish its nature. Of possible hypotheses rheumatismal pericarditis was the most probable. Two frictions daily with tincture of iodine, friction of the extremities with alcohol, and alternate administration of a solution of salicylate of caffein and sodium, and tincture of digitalis were prescribed.

On the 17th the general state was aggravated; dysphagia, urine rare, no defecation—scrotal œdema, jugular pulse accentuated; 28 to 30 respirations. The temperature which was 41·2 on the evening of the 16th was 40·7 on the morning of the 17th, and 40·4 in the evening. Same treatment with fragments of gelatine and two injections, one of milk and one of broth.

The 18th, state still bad. Scrotal œdema increased and reaching the hind limbs, 100 cardiac pulsations. The area of percussion increased, painful crises in the night with anguish and difficult deglutition. The dysphagia seemed connected with painful irradiation provoked by the passage of a ball in the œsophagus. Tincture of strophanthus and digitalis were substituted.

The 19th, same state, cardiac intermittences, respirations 28, pulse 96. Tincture of strophanthus regularly vomited, so returned

to digitalis. On the 20th, less dyspnœa and jugular pulse less marked. The patient sought drink and swallowed gelatine well.

On the 21st, continued improvement, effusion being reabsorbed, cardiac percussion area and friction diminished. Temperature 38·8 ; pulse 80. Improvement continued the following days and December 2 all symptoms had disappeared ; a little extension of the cardiac percussion zone only existed.

This observation shows two points not indicated in the classics : (1) Sensibility of the hypochondria immediately above the scyphoid appendix of the sternum ; (2) difficulty of deglutition, noticed up to the present in man only.

(*Revue Générale de Médecine Vétérinaire.*)

VAGINITIS INFECTIOSA SUIS.

By W. WIELAND.

Wangerin.

After an outbreak of contagious vaginal catarrh among the cows of the Blankenhagen estate had almost subsided, the steward's notice was called to 17 breeding sows, none of which had become pregnant. He thereupon castrated the boar and had the sows covered by a fresh sire. The result was no more successful than before. After the 17 sows had been covered four times and 6 different boars been employed, 2 of them became pregnant. The sows were shown to me on March 4. I examined 4 of them and found in 2 a severe streaky inflammation of the vaginal mucosa especially in the neighbourhood of the clitoris, and in the other 2 a purulent discharge. I will report again later on the course of the illness and its treatment. My view is that there was transmission of the disease from the cows to the swine, and yet we have hitherto supposed that the complaint was peculiar to cattle.—*Berliner Tierärzt Woch.*

A FAILURE OF DIAGNOSIS.

By W. B. SWITZER.

Oswego, N.Y.

A nine-year-old wagon horse showed a hard swelling as big as a cocoanut in the middle of the neck. It was slightly moveable between the muscles of the neck. According to the owner it was about the size of a walnut at first, and had been growing for five years. A year and a half previously a veterinary surgeon had considered it an unripe abscess, and applied a sharp blister. The author, who considered this tumour to be an encapsuled abscess, opened it very cautiously. To his astonishment very severe bleeding occurred. The blood spurted out under strong pressure, and the hæmorrhage endangered the life of the horse. After widening the incision and removal of hard hæmatomatic material (about $1\frac{1}{4}$ kilogrammes in weight), the vessel (rupture

of one of the upper arteries of the neck) was tied with catgut, and the hæmorrhage stopped. Healing of the wound took three weeks. After six months, ruffled hair at the site of the incision was about all that could be seen.

(*American Veterinary Review*, ex *Deutsche Tierärztliche Woch.*)

DANISH CO-OPERATIVE ABATTOIRS.

THE remarkable development of co-operation in Denmark calls for the attention of all those concerned with agriculture and sanitary questions. According to Hollman (writing in the *German Journal of Agriculture* for 1907), in 1903 there were twenty-nine co-operative abattoirs practising the slaughter of pigs for exportation. The estimate of agriculturists syndicated in these concerns was 67,200. In 1907 there were thirty-four co-operative slaughterhouses with 93,300 adherents. Of these thirty-four co-operative abattoirs, twenty-four were private slaughterhouses. About a third of the establishments in the whole country where pigs are fattened are adherent to societies existing for co-operative slaughtering, and more than half of the pigs slaughtered annually are sacrified in the corporate abattoirs. In some parts of Denmark co-operation has quite entered into the daily life of the producers; thus in the island of Borholm 85·8 per cent. of pigs killed are slaughtered at the co-operative establishments, and 53 per cent. of the breeders are adherent to these abattoirs. It is conjoint effort of societies which produces an average of 25 to 108 tons of meat a year, from which the supply to the co-operative abattoirs is chiefly derived.

(*L'Hygiène de la Viande et du Lait.*)

Letters and Communications, &c.

G. Mayall; P. R. Thompson; Lieutenant Stewart; Secretary, Royal College of Veterinary Surgeons; Secretary, Royal (Dick) Veterinary College; L. M. Douglas; E. W. Bevan.

Books and Periodicals, &c., Received.

Journal of Meat and Milk Hygiene; Journal of the Royal Army Medical Corps; Proceedings of the Royal Society of Medicine; Board of Agriculture and Fisheries; Department of Agriculture and Technical Instruction for Ireland; Tropical Agriculturist; Agricultural Journal for the Union of South Africa; Bureau of Animal Industry.

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PROFESSOR A. E. METTAM, B.Sc., M.R.C.V.S., M.R.I.A.,

President of the Royal College of Veterinary Surgeons, and Principal of the Royal Veterinary College of Ireland.

THE

VETERINARY JOURNAL

AUGUST, 1911.

PRINCIPAL METTAM, B.Sc., M.R.C.V.S.

THE PRESIDENT OF THE ROYAL COLLEGE OF VETERINARY SURGEONS.

THE Council of the Royal College of Veterinary Surgeons must be congratulated on their selection of Professor Mettam to fill the presidential chair during such an important year as this, as very few men in the profession have attained so high a position and so much distinction in the world of science in so short a time.

Graduating in 1889 from the Royal (Dick) Veterinary College in Edinburgh, his hard-working student career was completed by the capture of the first Fitzwygram prize with 1,980 marks out of a possible 2,000, a result which would be hard to excel. In 1890 he returned to his Alma Mater as assistant to Professor (now Sir John) McFadyean, and in 1892 succeeded him in the Professorship of Anatomy, a position which he very ably filled and in which he gained the respect of all his students. In 1895, aspiring to further honours, Professor Mettam graduated as a Bachelor of Science in the Edinburgh University, with highest possible distinction, and in 1896 was elected George Heriot Research Fellow of the University.

In 1900 the idea of founding a Veterinary College in Ireland was brought to completion, and Professor Mettam was selected from a large number of applicants for the Principalship. How worthily the selection has been justified is shown by the results which have been attained. No College is more popular amongst the students, and no College is more prosperous. The buildings were all set up in accord with Professor Mettam's ideas—ideas culled from a tour amongst all the best Continental colleges, and modified or enlarged

upon as occasion demanded, with many original suggestions which have made it thoroughly up-to-date.

On the teaching staff, in addition to the duties of Principal, Professor Mettam occupies the Chair of Pathology and Bacteriology, and the high percentage of passes at the examinations bears evidence to the thoroughness of his teaching.

In 1902 he was elected a member of the Royal Irish Academy, and at the present time he is the senior Vice-President of the Royal Zoological Society of Ireland, of whose Council he has been a member for the past seven years.

His contributions to science have been many, especially to the veterinary periodicals and to various societies, including the Royal Irish Academy, and the Royal Academy of Medicine of Ireland; and quite recently, by way of direct variation from the paths of study, he was made the "Officer Commanding" the Royal Veterinary College of Ireland Officers' Training Corps. His many and varied qualities will make every member of the profession feel sure that the helm of their particular ship is in capable hands, and will be guided quite serenely and safely through the troubled waters of another year.

Editorials.

THE ROYAL COMMISSION ON TUBERCULOSIS.

In this issue we give a rather full abstract of the final report of the above Royal Commission, and it goes without saying that it is full of most interesting and instructive information. We make no apology for the length of the abstract which, on the other hand, might have been even longer with advantage. Every word of it should be read and carefully assimilated, and it will repay the reader to make a careful analysis for himself of the cases recorded as to the occurrence in the human subject of tuberculosis caused by what has been described as the bovine tubercle bacillus.

The Royal Commissioners have been able to point out methods by which the origin of the bacilli in naturally occurring cases can be definitely ascertained, *i.e.*, whether of human or of bovine origin. The cultural characters and effects on experi-

mental animals are markedly different; but on the other hand they say "Distinction cannot accurately be made between the types of tubercle bacilli on the basis of microscopic characters alone." The Commissioners have not been able to produce any modifications or discover any transition stages from one type to another in experimental cases, *i.e.*, whatever organisms of bovine or human origin have been experimented with, their characters, both cultural and experimental, have remained unaltered. But they have found in naturally occurring cases, two forms of tubercle bacilli with characters resembling in part those of bovine origin and in part those of human origin. These two forms were found in lupus and in equine tuberculosis. Based on these facts the Commissioners are of opinion that in spite of their inability to produce transition stages the different types of tubercle bacilli must be regarded simply as varieties of the same organism. They have been able to prove conclusively that bovine tuberculosis is undeniably transmissible to the human being, and that it produces disease anatomically and histologically identical with human tuberculosis. In all such cases, therefore, human tuberculosis is the same disease as bovine tuberculosis.

That is, perhaps, the most notable of many very important pronouncements, and it should greatly strengthen the hands of those who are agitating for a crusade against bovine tuberculosis on account of the dangers to mankind. But as the President of the National Veterinary Association (Mr. T. Salusbury Price) so aptly remarked in the course of his excellent presidential address at the Carnarvon meeting, farmers have sufficient economic grounds for attempting to eradicate the disease apart from the transmissibility to man. He said: "Farmers should remember that the healthy cow is the one that thrives best, takes less food to do it, and is less expense in every way than the tuberculous cow." He suggested, and we agree with him, that it would pay the farmer himself to get rid of the disease and not wait for the Government to do it.

It must not, however, be forgotten that the consumptive human being is still the greatest factor in the spread of human tuberculosis, and the educational campaign for the dissemination of knowledge to the masses of the populace as to these various dangers must be persisted in, so that all and sundry may assist in checking the ravages of this terrible scourge.

It would be very regrettable if the labours of this Royal Commission were to cease at this stage, and we sincerely trust that they may be instructed to continue their investigations and assist in elucidating many of the still obscure problems relating to the disease.

THE NATIONAL VETERINARY ASSOCIATION.

THE National meeting of 1911 is now a thing of the past, and all who attended it are unanimous in their verdict that it has been a great success. It is certainly unfortunate that the attendance was somewhat smaller than the average, but what was lacking in numbers was quite compensated for by enthusiasm. The papers provoked excellent discussions, and the social events went with a swing that must have caused great satisfaction to the genial President, Mr. T. Salusbury Price, and the very energetic local Secretary, Mr. Wynn Lloyd, to whom the thanks of all who attended are certainly due.

A very important event was the acceptation by the National of the suggested alteration of rules to allow of affiliation with it of the various local societies. It is of importance to note that of eighteen societies which have reported on the scheme, three have decided against it, while fifteen have agreed to it either *in toto* or subject to minor alterations. The Association therefore considered it advisable to assent to the scheme, and the Committee which formulated the rules, with Dr. Bradley as Chairman, has been commissioned to proceed and arrange the necessary formalities for bringing the scheme to a workable conclusion. It is hoped that all the arrangements will be made and brought into effect at next year's meeting in Lancashire.

General Articles.

SOME DEBATABLE POINTS OF UNSOUNDNESS IN HORSES.*

By GERALD BLOXSOME, M.R.C.V.S.
Brighton.

THE rule as to unsoundness is, that if at the time of sale, the horse has any disease, which either actually does diminish the natural usefulness of the animal, so as to make him less capable of work of any description, or which in its ordinary progress will diminish the natural usefulness of the animal, or if the horse has, either from disease (whether such disease be congenital or arise subsequently to its birth), or from accident undergone any alteration of structure that either actually does at the time, or in its ordinary effects will diminish the natural usefulness of the horse, such a horse is unsound.

Soundness is another matter altogether. When we say that a horse is sound we mean that he is free from disease. The first point which I would draw your attention to is one that is common to every horse of four years old and upwards, namely splint.

You cannot legally give a certificate stating a horse to be sound when a splint is present, although it is frequently done.

Neither is it permissible to sell a horse with a splint as a sound horse; for the seller is in such circumstances liable to an action at law, and to being compelled to take the horse back. If he says he believes the horse to be sound, that is another matter, and he cannot then be compelled to take the horse back.

But the question in my mind is, should the presence of a splint constitute unsoundness. We all know that whilst a splint is in process of formation, lameness may and probably does exist, but when once compact bone tissue is formed there is no more fear of such recurring, or of the horse's usefulness being in any way impaired.

Then again, a good deal is made of the position of a splint, but when once formed, and the horse goes sound, I do not believe it makes the slightest difference where it is placed. Personally I would rather buy a horse with a splint than one without,

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* Read at the meeting of the Southern Counties Veterinary Society.

for I believe that I should be obtaining the more valuable animal of the two.

The next defect for our consideration is sidebone, one of the scheduled hereditary unsoundnesses on the list of the Royal Commission on Horsebreeding. Clearly a horse with a sidebone, according to present law, cannot be deemed a sound horse; still hundreds of horses so affected are at work to-day, and their usefulness is not impaired on account of their being so affected.

I well remember when at College being astounded by a particularly bold statement from Professor Macqueen, "that he had never seen a horse lame from sidebone." At that time it was difficult for me to believe this; to-day I can honestly say, that where a sidebone is so far formed that one can positively state that it is present, I have never seen a horse suffering lameness from it. That horses do go lame from sidebone during the process of the replacement of the lateral cartilage by bone is, I believe, quite possible, but who is able to say positively when this is the case? There is absolutely nothing to see; no heat, no pointing, no alteration in the shape of the foot, perfect flexibility of the cartilage above the coronet, yet the lameness is there, persistent, and hidden in obscurity. It is reasonable to presume that in such a case, the replacing of a comparatively soft material, such as cartilage, between the sensitive laminæ and the pedal bone, by a hard, unyielding substance such as bone, must cause pain and consequent lameness. When, however, this change has extended throughout the entire extent of the cartilage, so that it is easily discerned by palpation above the coronet, it is complete below; the inflammatory condition has subsided, the parts have become adapted, and there is nothing to cause lameness. Certainly the presence of an upstanding piece of bone above the coronet does not cause it, as we can see by noticing the many hundreds of horses affected and in hard work every day, and who go perfectly sound. I think those of you who are in the habit of examining carthorses will bear me out in this. Take for instance those firms who, when replenishing their studs, are careful only to buy horses not less than four years of age, and free from sidebones, and watch those horses during their years of service, and you will find that at least 50 per cent. develop sidebone, unbeknown usually to their owners, and without showing lameness or impairing their usefulness.

Amongst hunters sidebone is of course not so common, but I have never seen a hunter with pronounced sidebones lame from them, and I can call to mind many instances of brilliant performers keeping perfectly sound with large sidebones.

The conclusion therefore that forces itself upon me is, that although we must clearly class sidebone as an unsoundness, still in the state that we are able to recognize it, it does not cause lameness. That it may cause lameness in the earlier stages is quite probable, and it is reasonable even to attribute many cases of obscure lameness in the foot to incipient sidebone.

Another point that often causes differences of opinion is a lumpy conformation of the distal extremity of the os suffraginis, which is so often confounded with ringbone. It is not the result of disease, and should not be classed as an unsoundness. It is generally seen in well-bred horses, such having but little connective tissue between the skin and the bone, and consequently the prominences show up more distinctly; but any class of horse occasionally shows this conformation. When present at all, it usually shows to some extent on all four limbs, so that we should not fall into the error of mistaking it for true ringbone, but I have done so myself I know on more than one occasion.

In examining at shows for hereditary unsoundness this is a particularly important point, and is explanatory of the fact of particular horses being passed as free from hereditary disease at one show, and being crabbed at the next. It is unfair to the owner, causes a great deal of bitterness, and sometimes personal animosity, and is certainly a point on which we should have an uniformity of opinion.

True ringbone, where the joint is involved, always causes lameness, but *every* enlargement round the neighbourhood of the coronet is not necessarily a ringbone, and I think we should be far more careful than we very often are in applying the term promiscuously to every coronary enlargement.

The last point that I intend referring to is perhaps the most important of all; it is what we may call "spurious spavin." I believe it to be a fact that more horses are "crabbed" for imaginary spavins than for anything else.

There seems to be a rooted idea that a state of soundness can only exist with absolute symmetry, which I cannot regard as a right or proper inference.

Take the human body, for instance. How many of us are there I wonder who have a pair of anything? We have two arms, two legs, two eyes, &c., but they are very seldom symmetrical. Similarly with horses we often find differences of conformation not the result of disease at all, and not unsoundness. Probably one of the commonest is extra development of the ridge of the cuneiform magnum. Now the extra development may be very, very slight, but cover it with the ligament, connective tissue, and skin, and the extra development becomes distinctly appreciable; it is just on the seat of spavin, and we wonder what we are to call it.

There is no getting away from the fact that we are in a disagreeable position. We may satisfy ourselves by every possible test that the enlargement is not the result of disease but a matter of conformation only, but there is this appreciable difference between the two hocks which others may be able to see as well as ourselves. Very possibly the owner or purchaser may show the horse to some other practitioner and casually ask his opinion of that hock. This gentleman probably has not the chance to make the careful examination that we have done; he merely looks at it, compares it with the other, and says, "Oh yes, there is a spavin there." The owner says, "I thought so," or "I was afraid there was"; and though that horse may go sound for years, he will always believe that a spavin is there.

Sometimes both hocks are similarly affected and appear lumpy; in this case the diagnosis should be greatly simplified. It is most unusual, if not impossible, for a spavin to form in each hock simultaneously, and the facts that the two hocks are symmetrical, that there is no lameness, and that both hocks are flexed to the same extent, should be quite sufficient ground to prove the absence of spavin.

CONTRIBUTION TO THE OPHTHALMIĆ REACTION OBTAINED WITH BOVO-TUBERCULIN D (MERCK).

By Veterinary-Surgeon ABEL-GRABEN,
Baden.

Translated and Note added by Professor A. Wilson, Edinburgh, from *Berliner Tierärztliche Wochenschrift*, April 6, 1911, pp. 236, 237.

For the diagnosis of tuberculosis in cattle, veterinary surgeons have hitherto had to rely upon the reaction of the animals after the injection of Koch's tuberculin. The results obtained in this way were not always reliable, yet the method could not be abandoned in spite of its deficiencies, inasmuch as its utility was established as a fact (stood unquestioned).

In the tuberculin method, the complicated technique, particularly the registering of the temperature, the impossibility of applying the test to feverish animals, or of repeating it within a certain fixed period, all had a disturbing effect. The last-mentioned disadvantage even gave opportunities for fraudulent manipulations.

To avoid the necessity for the constant attendance of the veterinary surgeon to register the temperature, various ways of fixing the thermometer in the rectum of inoculated animals were tried. These, however, also had their disadvantages, which prevented them from coming into general use. It follows that veterinary surgeons would gladly welcome a more perfect method for the timely recognition of tuberculosis.

This method, I venture to think, has been found in the Ophthalmic Reaction, if the experimenters employing it more extensively should obtain the same results as myself, in which I came to the same conclusion as Garth of Darmstadt.

In this test, it is immaterial whether the animals are free from fever or not; the inconvenient taking of the temperature is not necessary, and the operation can be repeated at any time.

The importance of the matter induced me to take every opportunity of carrying out the test. That is not so easy for the practical veterinarian, inasmuch as it is not sufficient to observe the rise and fall of the reaction; the control in a slaughtered animal is also necessary.

I made use of the bovo-tuberculin D, as recommended by Garth.

The chemical manufactory of Merck at Darmstadt very kindly placed the material for my inoculations at my disposal, for which I desire here to express my best thanks.

The bovo-tuberculin D is obtained from pure cultures of tubercle bacilli, and represents the tuberculous toxin unaltered as to quality; it contains the poisonous matters of the culture-fluid, as well as those of the bacterial cells, in the most concentrated form. This preparation is equal to tuberculin E plus tuberculin F. Tuberculin E is the component obtained from the bacterial bodies, whilst tuberculin F is the part recovered from the culture-fluid.

The installation was carried out with Hauptner's 1-gram inoculation syringe.

I desire to call special attention to the advantage gained by placing the inoculated animals in such a way that an eventual licking off of the secretion by neighbouring animals is impossible.

Signs of irritation, *e.g.*, rubbing of the inoculated animals, have never been observed by me.

The positive reaction, it is well known, consists in the appearance of pus in the conjunctival sac of the inoculated eye; and decidedly pus, not merely a serous fluid.

I publish my experiments in order to increase the interest of veterinary surgeons in the matter. In the following I enumerate my experiments in chronological succession :—

Case I.—Cow, under veterinary treatment for chronic metritis and chronic diarrhœa. The former disease was the result of a difficult parturition in the preceding year. In the extraction of the calf carried out by a non-professional man, extensive wounding of the vagina and uterine cervix, with retention of the placenta, occurred. Recovery was incomplete inasmuch as a permanent discharge remained from the open cervix.

Latterly, the animal began to emaciate and slaughter was decided on.

The owner allowed me to inoculate with tuberculin. No reaction occurred.

The cow was seen to be free from tuberculosis after slaughter, *i.e.*, tuberculous changes could not be demonstrated in any organ or lymphatic gland.

Case II.—Cow, known to me about a year, has had a cough during this time, emaciated lately. Clinical diagnosis: Pulmonary tuberculosis. Inoculated. On the following day, at the eighteenth

hour, a decidedly purulent discharge was seen in the instilled eye, so that purulent matter covered the skin below the inner canthus. There was a typical reaction, which disappeared on the following day. Pulmonary tuberculosis in an advanced stage was demonstrated at the post-mortem.

Case III.—Cow, suffered about three months ago from decubitus, rose again after five days, appeared to recover, and calved normally, four weeks later.

Recently, emaciation, poor appetite, weakness in progression. Inoculated, sixteen hours after the inoculation, a pus concretion the size of a pea showed itself in the inner canthus of the treated eye. On the following day, the eye was normal.

Cow, suffered from pulmonary tuberculosis, as was demonstrated after slaughter ; also from adhesive pleurisy and pericarditis.

The last condition, in the acute stage, might have been the cause of the decubitus.

Case IV.—Old cow, suffered from cough for a long time, feeding well ; condition fair. Recently, the cow gave birth to a very small calf, and gave hardly any milk. Inoculated, twenty hours later, a pea-sized pus concretion (showed) in the inner canthus.

Slaughter gave evidence of pulmonary tuberculosis.

Case V.—Cow, known to me for some considerable time ; suffered from chronic lameness, and was therefore going to be killed. At my suggestion, she was inoculated. No reaction. I was present at the *post mortem ;* no tuberculosis could be demonstrated.

Case VI.—Young cow ; was to be killed owing to sterility ; inoculated ; no reaction. I made the *post mortem*, which showed no tuberculosis.

Case VII.—Analogous to Case 6.

Case VIII.—Fat cow ; owner wished to know if he could sell the animal with a warranty without scruple. Inoculated at my suggestion. No reaction. I was present when she was killed. No tuberculosis.

Case IX.—Cow, under treatment for cough, bad appetite, and emaciation. Fever up to 39·7C. Clinical diagnosis : tuberculosis. Inoculated, on the following day, twenty hours after the installation, a purulent discharge (appeared), which increased so much during the succeeding hours, that the skin under the treated eye was covered with pus.

Slaughtered. Tuberculosis of the lungs and liver.

Case X.—Cow, under treatment for cough, emaciation, arrest

of milk-secretion. Clinical diagnosis: Tuberculosis. Inoculated and reacted as marked Case 9.

Slaughtered. Tuberculosis of the lungs, liver, intestines, ovaries, Fallopian tubes, and uterus.

Case XI.—Cow, extremely emaciated, chronic diarrhœa. Inoculated. On the following day purulent discharge from the inoculated eye. Slaughtering showed the existence of pulmonary tuberculosis.

Case XII.—Old cow, coughs, losing condition. Clinical diagnosis: Tuberculosis. Inoculated. On the following day, collections of pus, the size of a pea, in the inner canthus. *Post-mortem*: Pulmonary tuberculosis.

Case XIII.—Young cow, much emaciated, cough. Clinical diagnosis: Tuberculosis. Inoculated. On the following day, profuse, purulent discharge from the treated eye. During the examination, the owner stated that the discharge would have been still more profuse had not the next cow licked a portion of it off. Slaughtered. Pulmonary tuberculosis.

Case XIV.—Ox, intended for the butcher. Inoculated at the owner's wish; no reaction. No tuberculosis when slaughtered.

In all reacting animals the normal condition was restored forty-eight hours after the instillation. Secondary phenomena were not observed.

The reliability of the test has been demonstrated uniformly in all cases observed by me. All reacting animals have been diseased, as the *post-mortem* conditions have shown.

Six animals did not react, and they were found to be free from tuberculosis after slaughter.

On the strength of these results, I do not hesitate to endorse Garth's opinion, and consider the conjunctival-reaction produced by bovo-tuberculin D as a more useful means of diagnosing tuberculosis than the subcutaneous injections of Koch's tuberculin.

[*Translator's Note.*]—The author of the above article, in the translator's opinion, takes an altogether too optimistic view of the ophthalmic tuberculin test. Some extensive trials in this country have assigned it an important place as a useful auxiliary diagnostic agent; but few, if any, British veterinarians hold that it approaches, equals, or surpasses the classic subcutaneous test in reliability. From 5 to 15 per cent. of cattle which react at one time or another to the general test fail to give a conjunctival result to one or several instillations in the same or in the control eye. Neverthe-

less, when the opportunity has arisen to make a *post-mortem* examination, tuberculous lesions have, as a rule, been in evidence.

The ophthalmic method is undoubtedly very convenient for the preliminary weeding-out of tuberculous subjects from a herd out of doors, fevered or freshly travelled animals.

It cannot, however, at the present time take the place of the hypodermic method, with which it is advantageously combined.

Details are given of fourteen cases, of which six were negative, and eight positive, the test agreeing with the *post-mortem* appearances in every instance.

The autopsies increase the value of the experiment very considerably. The author, however, seems to rely entirely on the presence or absence of pus in the sac or on the face at the inner canthus; at any rate, other phenomena are not mentioned; while in every reacting animal (some of them apparently marked) there was a return to normal in forty-eight hours.

Our usual experience is that a marked reaction may persist for a longer time. [A. W.]

THE FORMATION OF HYDROCYANIC ACID FROM LINSEED CAKE.*

BY G. D. LANDER, D.Sc., F.I.C.,
Professor in the Royal Veterinary College, London.

THE occurrence of cyanogenetic glucosides in linseed has been long known, and the work of Dunstan and Henry (*Proceedings of the Royal Society*, B. 78, 1906, 145) established the identity of this substance with phaseolunatin, the glucoside of Java beans. The linseed contains the same enzyme, capable of resolving the glucoside, which is also chemically resolved by 10 per cent. hydrochloric acid.

Regarding the occurrence in linseed cakes, the same authors (*Journal of the Board of Agriculture*, March 1908, 729) quote two commercial cakes which gave total hydrocyanic acid 0·035 and 0·041 per cent. respectively. But they clearly emphasize the important question of "availability" of the poison, showing that no acid is formed on maceration with cold water, the enzyme having been, presumably, destroyed by the heating during process of manufacture.

* From the *Journal of the Board of Agriculture.*

With such cake there can hardly be any question of poisoning, since there is no evidence to show that the glucoside is poisonous, or that it is resolved by digestive ferments or those contained in other foods.

Cakes are, however, often met with which yield "available" hydrocyanic acid, by which it is to be clearly understood that maceration with cold water produces free hydrocyanic acid. In such instances it is probable that part of the original enzyme has escaped destruction by heat. It has been found that fermentation goes on in 1 per cent. hydrochloric acid and also in 1 per cent. sodium bicarbonate solutions, and would not therefore be inhibited by the body fluids. The development of acid is, moreover, complete on twelve hours' digestion in water at 12° C. None of the cakes examined here contained more than 0·025 per cent. of available acid. Dr. Voelcker has kindly informed me of several cakes examined by him of which the lowest gave 0·0046 per cent. or 0·321 grains per pound, the highest 0·051 per cent., or 3·57 grain per pound. My own specimens averaged 0·025 per cent. Dr. Voelcker's 0·051 per cent. sample was a Calcutta cake, and he was informed that sheep refused it, unless kept without other food.*

The maximum noted by Dunstan and Henry (*loc. cit.*) for Java beans is 0·123 per cent., and it might therefore, bearing in mind the fairly rapid evolution of acid, be anticipated that linseed cakes, especially such as the one noted by Dr. Voelcker, might prove injurious, possibly even fatal. Taking cake of 0·025 per cent. hydrocyanic acid, a daily ration of 1 lb. for a sheep means a daily dose of 1·75 grains of acid, slowly evolved during digestion. A 2-lb. ration for a heifer would represent 3·5 grains of acid per diem. The medicinal doses are for the sheep $\frac{1}{3}$, for the horse or ox $\frac{5}{6}$ grain.

By the courtesy of Colonel Duncombe and Mr. E. G. Haskell, M.R.C.V.S., we were able to carry out feeding tests on sheep and on a heifer, which had for their primary object the elucidation of obscure cases of blindness affecting heifers. Incidentally, it was hoped to solve the question of the harmfulness or otherwise of the cake.

The results are here briefly summarized (HCN = Hydrocyanic acid) :—

(1) A sheep had 1 lb. cake (0·025 per cent. HCN) per diem for 36 consecutive days. No result.

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* See also *Journ. R.A.S.E.*, 1909, p. 342.

(2) A sheep had 1 lb. for 31 days ; 5 lb. for 2 days ; and after 7 days a further 5 lb. No result.

(3) A heifer (six months) had :—

1 lb. per day dry cake for 4 days.
1 lb. per day moist cake for 13 days.
2 lb. per day moist cake for 2 days.
5 lb. per day moist cake for 18 days.

Fourteen days interval.

5 lb. per day moist cake for 30 days.

Total 261 lb. cake in 67 days equal to 456·75 grains of hydrocyanic acid.

No definite results having been obtained, the cake was discontinued, and after about six weeks acid in the form of pure potassium cyanide (KCN) was fed as follows :—

KCN equiv. to 3·5 grains HCN in ordinary food 4 days.
KCN equiv. to 7·0 grains HCN in ordinary food 1 day.
KCN equiv. to 10·0 grains HCN in ordinary food 1 day.

Interval 2 days.

KCN equiv. to 15·0 grains HCN in ordinary food 2 days.
Total 61·0 grains HCN in 10 days.

No obvious results were got. The animal at first refused the larger doses, but ate the food within an hour.

Fifteen grains hydrocyanic acid were then fed with 7 lb. of bran in one feed, and next day a further 15 grains, in this case liberated from the salt by an equivalent amount of dilute hydrochloric acid. No notable result was got.

After eight days, cyanide equivalent to 22·5 grains hydrocyanic acid were given in a gentian ball inserted into the rumen, and as no notable result ensued next day 30 grains were similarly administered. This proved fatal within two hours.

From these observations it may be concluded that cake such as that used is harmless. Variation due to idiosyncrasy is possible, and a cake of 0·05 per cent. would in an 8-lb. feed give 28 grains of prussic acid, equal to a 4-lb. feed of Java beans showing 0·1 per cent. acid.

There seems no ground to suppose that hydrocyanic acid is cumulative. Indeed, for a poison so volatile and easily eliminated this would not be anticipated. Similarly when gradually developed hydrocyanic acid could probably be taken in larger quantities than would kill in one dose. The general evidence of our experiments

is against the supposition that tolerance or habituation is established, but one cannot regard this as definitely negatived.

Poisoning by giving linseed has been known and recorded, and our results cannot be taken as absolutely exclusive of the possibility with cakes, especially with sheep. In this connection a test on sheep with a 0·05 per cent. cake and a determination of the toxic dose of the pure drug would be most desirable.

BOVINE PYELO-NEPHRITIS IN VICTORIA DUE TO A BACILLUS DISTINCT FROM THE BACILLUS OF ENDERLEN.

By J. A. GILRUTH, D.V.Sc., M.R.C.V.S., F.R.S.E.
Professor of Veterinary Pathology, University of Melbourne.

THIS disease is well known to continental veterinarians, but so far as I am aware has not heretofore been recognized or at least recorded as existing in Australia.

That, however, it cannot be very uncommon is proved by the fact that it is occasionally seen in cows slaughtered in good or fair condition at the Melbourne City Abattoir. During the past year three cases have been brought under my notice by the Director, Mr. John Robertson. Unfortunately the first two specimens had been kept too long for satisfactory bacteriological examination—the photograph of one is reproduced showing the extensive nature of the disease—but in the last instance they were fresh.

The disease, especially in European countries, has been frequently recorded. It gives rise to fairly definite symptoms, such as irregularity of appetite and rumination and progressive cachexia, although the temperature remains normal, and the milk secretion is but little altered. In the later stages, there is frequent urination, the urine being turbid, and brownish or reddish in colour, with whitish flocculi. Colicky pains appear intermittently; pressure over the flank shows tenderness; while rectal examination may give definite indications of renal abnormality.

The causal organism of pyelo-nephritis is generally conceded to be the bacillus first isolated and described by Enderlen in 1891, termed the *B. nephritidis bovis*, or the coryne-bacterium,

a non-motile Gram-positive organism growing readily on artificial media, but not on potato, not curdling milk, and non-pathogenic to laboratory animals, or even to bovines when introduced into the subcutaneous tissues.

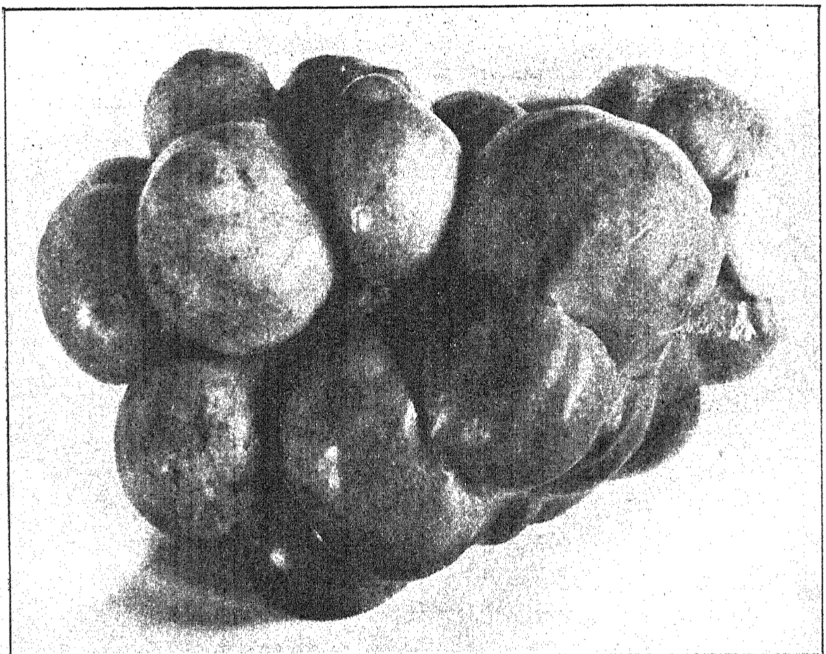
Although experiments have failed to reproduce the renal disease, its almost constant presence often in a state of purity in the lesions of bovine pyelo-nephritis, leads to the conclusion that it is the specific cause of the disease as a rule in Europe. Clinical evidence points strongly to the occurrence of infection about the time of calving or shortly after parturition, and the probabilities are that infection is really an extension of a catarrhal or other inflammatory process through the urinary system from the vulva. This is supported by the fact that the disease is unknown in males, and in females which have never borne calves.

In the case under review it was evident from the general condition of the carcase, and the amount of fat surrounding the kidneys, that but little general disturbance had accompanied the lesions: the animal had been purchased by a butcher in the ordinary way for beef purposes. Only the kidneys with small portions of the ureters had been retained for me, but there is no reason to believe that any other very evident lesions had been overlooked. Both kidneys were affected, the right most markedly. Following are the notes:—

Right kidney greatly enlarged, the weight when stripped of fat being 6 lb. The posterior two-thirds of the organ is converted into a large abscess, composed of about a pint of thick, tenacious, glutinous, greyish-coloured purulent material, enclosed within a dense fibrous, slatey-coloured wall, varying in thickness from ½ in. to 1 in. The anterior third shows a large collection of similar pus within the pelvis: the apices are atrophied, and the medulla infiltrated with pus, the cortex being congested and much denser than normal. The ureter is greatly thickened, being ¾ in. in diameter, and containing similar purulent material to that observed within the kidney. Left kidney normal in size. Four abscesses varying in size from a marble to a large walnut present within the kidney substance; each cavity contains pus similar in character to that described and is surrounded by a thin fibrous wall. Only one of these abscesses communicated with the kidney pelvis, but this was probably of

recent occurrence as the ureter contains no purulent material although the walls are slightly thickened. That these abscesses are of some standing is evident by the presence of much calcareous material in two of them.

Microscopical examination of the purulent material showed a number of bacilli varying in length from a short ovoid organism the length double the breadth, many within polymorphs, which were more or less degenerated. The bacilli had not the



Pyelo-nephritis. $\frac{1}{3}$ natural size.

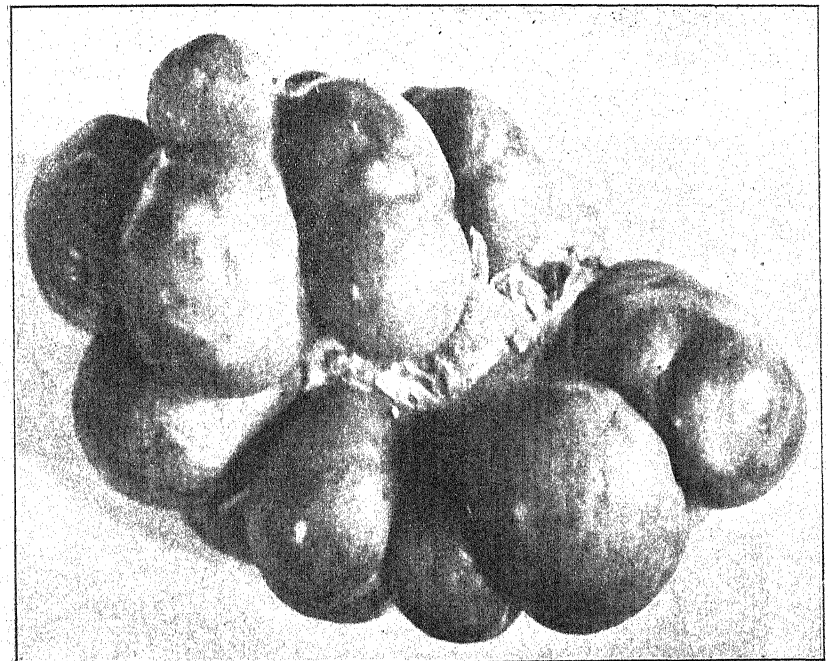
morphology ascribed to the coryne-bacterium, and were Gram negative, a number showing distinct bipolar staining.

Sections of the kidneys show chronic interstitial cirrhosis with distension of many of the descending tubules which contain hyaline casts and occasionally a few wandering cells, but no bacteria can be detected. Generally speaking the epithelium is but little altered, especially that of the convoluted tubules and the glomeruli, in spite of the great amount of new interstitial tissue present.

Agar and solidified serum slopes developed in twenty-four hours after inoculation at 37° C. almost pure cultures of bacilli morphologically similar to those observed on microscopical examination of the purulent semi-caseous material. Absolutely pure cultures were readily procured, and experiments on different animals were conducted with sub-cultures.

The following are the characters of the organisms:—

Bacillus, freely motile in young cultures, varying in size



Pyelo-nephritis. $\frac{1}{3}$ natural size.

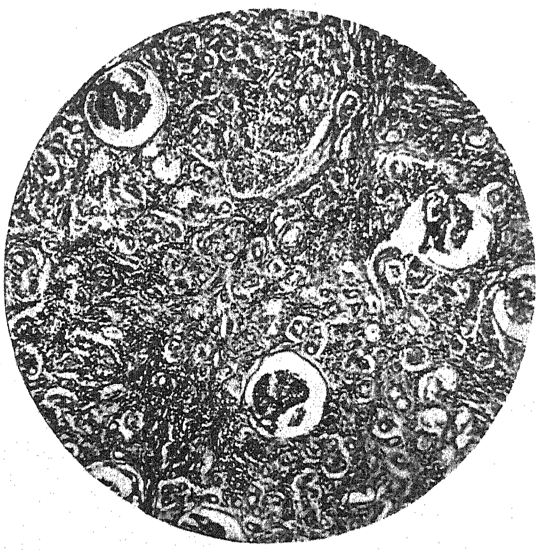
from almost a coccus to a bacillus 2 μ in length, breadth ·8 μ: stains readily by ordinary aniline dyes, but not by the method of Gram or its derivatives; frequently shows a bipolar staining; grows readily on all media, including potato, on which it develops as a thick, dirty, yellowish growth; does not liquefy gelatine; curdles milk slowly, having a definite digestive action on the clot; does not form gas or indol. It is fatal to guinea-pigs and rabbits, especially if young cultures are employed, but

produces no serious results if injected subcutaneously into bovines.

The cultural characters in detail are as follows:—

Agar and slope serum: colonies spherical, with smooth edges 2-5 mm. in diameter, creamy in colour. In streaks, thick, raised creamy growth with smooth edges.

Broth rapidly becomes cloudy with slight pellicle, and heavy deposit; bacilli in this medium at first actively motile, but in two or three days lose the motility, when the liquid rapidly clears.



Pyelo-nephritis. Section of kidney showing chronic interstitial cirrhosis. × 58.

Potato: thick yellowish white, dirty-looking thick growth, which does not increase after forty-eight hours.

Milk: curdled in forty-eight hours; clot thereafter slowly digested. Gelatine: in two to three days, at room temperature definite growth, somewhat translucent, with smooth edges; no liquefaction.

EXPERIMENTS ON ANIMALS.

The following are the details:—

Rabbits.

Rabbit 21 inoculated with 1 c.c. twenty-four hours old subculture on broth (as used for guinea-pig 95) was found dead

twenty hours later. *Post-mortem* examination showed a large œdematous swelling distending the subcutaneous tissues of the inoculated limb (posterior) and along the abdomen. The swelling measured about 12 x 8 cm., and the œdema was semi-gelatinous: the muscles were pale and degenerated; internal organs normal. In the œdema many bacilli were present, and but few leucocytes. The blood was apparently sterile, but media inoculated developed colonies of typical bacilli in a state of purity.

Rabbit 35 was inoculated with 1 c.c. sub-culture in broth from rabbit 21 (as used for guinea-pig 121). In twenty-four hours the animal was ill, and showing considerable swelling of inoculated region. Death occurred in thirty-six hours, *post-mortem* examination disclosing simply a large œdematous swelling infiltrating the muscles and subcutaneous tissues of the inoculated limb; otherwise organs and tissues normal. Many bacilli with few leucocytes were found present in the œdema, and though the blood and organs were apparently sterile, media inoculated with the former developed numerous colonies of the bacilli.

Rabbit 37 inoculated with 0.5 c.c. first sub-culture from blood of rabbit 35 (as used for guinea-pig 140) was found dead eighteen hours later. *Post-mortem* examination showed much œdematous infiltration of the subcutaneous and muscular tissues of the inoculated region; otherwise there was no lesion.

Guinea-pigs.

Guinea-pig 86 inoculated with 1 c.c. five days' old sub-culture gradually developed a large firm dense swelling at the seat of inoculation, followed by a caseo-purulent abscess which ruptured on the twelfth day, this being followed by gradual healing. The characteristic bacilli were found present in the pus. On final slaughter of the animal some time later no secondary lesions were found.

Guinea-pig 95 inoculated with 1 c.c. twenty-four hours' old sub-culture in broth, also developed a large local abscess, which ruptured on the twelfth day. The animal, however, died on the fifteenth day. *Post-mortem* showed evidence of recent diarrhœa. A large irregular caseo-purulent mass extended forward along the subcutaneous tissue of the abdomen, thorax, and neck to the pharyngeal region. The internal organs were normal but

for a small caseous nodule the size of a pin-head in the spleen, and a fluid condition of the intestinal contents. Numerous bacilli were found in the caseo-purulent material, but the blood and internal organs were free, with the exception of the splenic nodule, which contained a few typical organisms.

Guinea-pig 121, inoculated with 1 c.c. second sub-culture of bacillus, recovered from rabbit 35, rapidly developed a large swelling, with great prostration and died in thirty-six hours. *Post-mortem* examination showed an acute inflammatory swelling with much œdema infiltrating the muscles at the seat of inoculation; otherwise there was no lesion.

Guinea-pig 140, inoculated with 0.5 c.c. first sub-culture from blood of rabbit 35, was found dead eighteen hours later. *Post-mortem* examination showed œdematous infiltration of the muscles and subcutaneous tissue at the seat of inoculation, but otherwise the tissues and organs were normal. Numerous bacilli were found present in the œdema of guinea-pigs 121 and 140, and that they were present in the blood and organs was proved by securing pure cultures on media inoculated therewith.

It is evident that passage of the bacillus through rabbits increases the virulence for guinea-pigs.

A cow in milk, but calved for some months, was treated by swabbing the vagina with a young virulent culture. A few days later a slight but distinct catarrhal condition of the vagina was observed and in this the characteristic bacilli were detected along with leucocytes and epithelial cells; but although this condition persisted for several days it was never marked and cleared up leaving the animal normal. When the animal was slaughtered some weeks later the kidneys and urinary tract were found normal.

Another cow injected subcutaneously with 1 c.c. culture, virulent for rabbits and guinea-pigs, remained normal beyond the development of a small firm swelling, which rapidly disappeared.

A calf 3 months old, inoculated subcutaneously with 1 c.c. virulent culture, the following day showed tenderness and diffuse swelling at the situation of the injection. The tenderness soon disappeared and in two days the swelling had become circumscribed and firm. Gradually this disappeared and left no trace.

The bacillus found practically in a state of purity within the purulent cavities of these kidneys is quite different to that

described as the usual cause of bovine pyelo-nephritis in European countries, as manifested by its motility, its ready growth on potato, staining reaction, &c. No organism corresponding to the coryne bacterium developed in any of the tubes of media inoculated with purulent material. Although experiments failed to induce the disease in bovines, the slight local reaction which followed its introduction subcutaneously and especially the definite though passing catarrh of the vagina, induced as a result of swabbing that canal with cultures, besides its virulence for rabbits and guinea-pigs, taken together with its presence in a state of practical purity in the renal lesions, forces one to the conclusion that it was the specific cause of the kidney lesions described.

It will be interesting to observe if examination of further cases in Australia, whether detected at abattoirs or in the field, leads to isolation of the same bacillus as described herein, or to the bacillus of Enderlen, as most frequently found in European cases.

At all events, seeing that such cases of pyelo-nephritis are occasionally found in cows slaughtered in good or fair condition for human consumption, and that the disease is often elsewhere the cause of definite symptoms and decided general disturbance, the possibility of its being a hitherto overlooked factor in otherwise obscure bovine complaints is well worthy of being borne in mind by practitioners.

A VARIETY OF THE VIBRION SEPTIQUE (BACILLUS OF MALIGNANT ŒDEMA), NON-PATHOGENIC FOR RABBITS.

By J. A. GILRUTH, D.V.Sc., M.R.C.V.S., F.R.S.E.,
Professor of Veterinary Pathology, University of Melbourne.

The virulence of the Vibrion septique of Pasteur for the rabbit is usually considered of some importance, chiefly in its relation to blackleg, or symptomatic anthrax. It is generally agreed that the bacillus causing the disease malignant œdema is frequently found associated with the *Bacillus chauveaui*, the cause of blackleg, and because of this association of the two anaerobes, so similar to each other in their morphology and their pathological effects, the difficulty

of separating the two, and especially the difficulty experienced in securing a pure culture of the latter, is well appreciated.

That the bacillus of malignant œdema is pathogenic for rabbits as well as guinea-pigs, while the bacillus of Chauveau is pathogenic for the latter and not for the former, is often insisted upon, although Conn curiously enough includes rabbits along with guinea-pigs as susceptible to inoculation (*Agricultural Bacteriology*, Conn, 1909, p. 287). Muir and Ritchie ("Manual of Bacteriology," 1899, p. 401) state "Rabbits are practically immune to this disease (quarter-evil), while they are comparatively susceptible to malignant œdema."

Nocard and Leclainche write in regard to *B. chauveaui*: "le lapin est sur la limite de la réciptivité" ("Les Maladies Microbiennes des animaux," 1904, p. 417), and in regard to the Vibrion septique (p. 390), "parmi les petits animaux le cobaye et le rat blanc sont surtout sensible ; viennent ensuite le lapin, la poule," &c.

As a test for the freedom of the culture of *B. chauveaui* from Vibrion septique some insist upon the rabbit test, *e.g.*, Besson (*Technique microbiologique*, 1904, p. 311) counsels "Vérifier la culture par l'examen microscopique . . . et en inoculant un lapin et un cobaye, si le cobaye *suel est tuè le virus est pur*."

Such may be said to be the general experience of bacteriologists, though few would go so far as Friedberger and Fröhner ("Veterinary Pathology," authorised translation, 1908, Vol. 2, pp. 243-4), who recommend with suspected material, "in order to be able to positively distinguish between anthrax and quarter-evil (Rauschbrand) we should inoculate simultaneously a rabbit and a guinea-pig. If only the guinea-pig dies, the disease is quarter-evil ; if both die it is anthrax."

In spite of the general experience, however, that a race of Vibrion septique does exist which is non-virulent for rabbits, the observations I propose to record show.

The original material was received from Dr. Reakes, Chief of the Veterinary Department of New Zealand, and consisted of pipettes of blood and subcutaneous œdema of a guinea-pig which had been inoculated with fluid secured from a case of septic metritis in a cow. It is well known that although the bacillus of malignant œdema in artificial cultures has little or no pathogenicity for the bovine, yet it may be found as the causative agent of post-partum septicæmic metritis.

The following is Dr. Reakes' note of the bacillus :—

"Microscopic examination of the uterine fluid of these cases disclosed the presence of mixed organisms (but no streptococci), many of them appearing to be ordinary putrefactive organisms, others longer and thinner rods. Putrefactive organisms were also present in the blood, *post-mortem* having been made some twenty-four hours after death.

"In each case guinea-pigs were inoculated with the uterine fluid and with the blood; those receiving the uterine fluid died within twenty-four hours, considerable œdema being present at the seat of inoculation and extending right along from the thigh to the thorax. Those inoculated with the blood did not die; a considerable local swelling appearing at the seat of inoculation.

"In the œdematous fluid from the guinea-pigs inoculated with the uterine fluid only one organism (an anaerobe) was present, this being apparently the malignant œdema bacillus.

"No bacilli could be detected in the blood of the same guinea-pigs, but other guinea-pigs inoculated with blood from these died in less than twenty-four hours, showing œdema at the seat of inoculation, the same bacillus being found present.

"The pipettes I am sending are :—

"(1) Œdematous fluid from seat of inoculation from guinea-pig dead after inoculation with uterine fluid from cow.

"(2) Blood from same guinea-pig.

"The cases have interested me very much, and I am sure that they will interest you also, particularly as malignant œdema is not common among adult cattle. Indeed, I observe that Professor Law in his 'Veterinary Medicine' states definitely that the mature ox is immune, and by this I understand him to mean mature cattle of both sexes."

Examination of the œdema on receipt by me showed bacilli of irregular length, some involuted and degenerated, some sporulating, and a number of free spores. The blood contained bacilli of the same breadth, varying very much in length, but none sporulating, the absence of spores being the chief distinguishing character of this organism.

Attempts to grow these organisms aerobically failed, all media inoculated remaining sterile.

In serum broth media inoculated under oil with œdema, and with blood, rapid growth occurred. In tubes inoculated with œdema, there was cloudiness with much gas formation, with typical

odour and bacilli typical of the Vibrion septique of varying lengths, motile, some sporulating at ends, some in centres, and Gram positive, were to be seen apparently in a state of purity. In tubes inoculated with blood, there developed cloudiness but no gas formation, due to bacilli of varying length, motile, but non-sporulating, and Gram negative.

With each of these cultures a guinea-pig was inoculated, No. 31 receiving 0·25 c.c. of that from the œdema, and No. 32 0·25 c.c. of that from the blood. Guinea-pig 32 remained normal, and even developed no local swelling.

Guinea-pig 31 was found dead and cold sixteen hours after inoculation: *post-mortem* examination showed the typical lesions of malignant œdema—much sero-sanguineous effusion with gas formation and the typical odour, infiltrating the subcutaneous tissues of the inoculated limb, and floor of the abdomen; otherwise there being practically no change. Microscopical examination of this effusion showed numerous bacilli extremely variable in length (up to 15 μ), often in pairs, sometimes in short or long chains, few sporing, motile, and Gram positive. In the spleen and liver similar bacilli were very numerous. The blood appeared sterile, though after incubation of heart blood in pipettes typical bacilli developed in numbers.

Guinea-pigs (two) inoculated with 0·1 c.c. of œdema from the first guinea-pig also succumbed within sixteen hours, the *post-mortem* appearances being similar to those described.

A rabbit inoculated with 0·2 c.c. of the same culture as injected into the first guinea-pig remained unaffected.

Another rabbit inoculated with 0·25 c.c. of the ordinary contents of the original pipette sent by Dr. Reakes remained unaffected, and still another rabbit, inoculated with 0·25 μ first culture in serum broth inoculated with subcutaneous œdema from the second guinea-pig resisted completely.

It will be seen, therefore, that in spite of what is generally contended, a culture of the bacillus of Blackleg cannot necessarily be deemed free of the malignant œdema bacillus simply because it is not pathogenic for the rabbit.

Clinical Articles.

RUPTURE OF THE DIAPHRAGM AND STRANGULATED DIAPHRAGMATIC HERNIA.

By H. A. STEWART, Lieut., A.V.C.

Roberts' Heights, Transvaal.

SINCE true *ante-mortem* ruptures of the diaphragm are so rare, it is hoped the following short article will be of interest, chiefly on account of the absence of tympany and the fact that there was no history of an accident.

An Army Service Corps mule was admitted to the Station Veterinary Hospital on May 29 exhibiting ordinary symptoms of colic. The temperature was 102.2° F., pulse 62 and wiry to the touch, and the respirations 20 per minute. Tympany was very slight, and mucous membranes were injected. Borborygmi were, however, distinctly heard, and nothing very serious anticipated. *Treatment.*—Aloes ʒv. and chloral hydrate ℥i. was administered, the animal was back-raked, and a Reid's pump used for enemata. As pain was persistent, after two hours another ℥i. of chloral was given. After this the animal became quiet, and remained so throughout the following day. On May 30 the temperature had subsided to 100.5° F., fæces and urine were passed, and there was a general appearance of convalescence, except that a sloppy bran and linseed mash was refused, and the mucous membranes remained injected.

At 6.30 a.m. on the 31st the mule was apparently in the same condition, but about two hours later he lay down on the off side and expired in less than five minutes, without a struggle.

A *post-mortem* examination was held about an hour and a half after death, exhibiting the following lesions. There was slight peritonitis and a diffuse inflammation of the *intra-abdominal* viscera. Kidneys rather pale and friable in consistence, liver fatty and in a state of venous congestion. In the muscular portion of the diaphragm on the right side was a rupture 6 or 7 in. in extent through which protruded 14½ ft. of small intestine —into the thoracic cavity. This displaced portion of gut occupied the bulk of the thorax, was in a condition of acute strangulation, and except for some serous exudate empty. Both lungs

were congested, especially the right one—presumably hypostasis. There was a considerable amount of pleurisy. The right heart was filled with dark, tarry blood; left heart empty. This and the condition of the lungs points to asphyxia being the direct cause of death.

The notable feature in this case is the enormous length of displaced intestine.

IMPACTION OF THE INTESTINES, FOLLOWED BY THE PASSAGE OF AN INTESTINAL CAST EIGHTEEN INCHES LONG.

By Captain A. J. WILLIAMS, F.R.C.V.S., A.V.C.
Longmoor, Hants.

Subject.—A Mounted Infantry cob, aged 13 years.

History, &c.—October 3, 1910.—Admitted for treatment, being off feed, dull, blowing, temperature 101° F. Placed in loose box, rugged and bandaged, mash diet, stimulant given.

During the afternoon symptoms of subacute colic appeared. Chloral hydrate ½ oz. given.

October 4, 1910.—Subacute pain continues, tympany, rectum empty, case diagnosed as impaction of intestines. Aloes Bbd. 4 drachms, and chloral hydrate 4 drachms, given; enemas, abdominal massage.

October 5, 1910.—Much worse, conjunctivæ injected; constantly lying down and rolling; passes small quantities of urine at short intervals; catheter passed but no urine found at 3 p.m. Ammon. carb. ½ oz. and pulv. nucis vom. 2 drachms in bolus three times a day.

October 6, 1910.—Condition serious, pulse very fast and weak, refuses all food, a very small quantity of fæces passed, hard pellets, complete absence of borborygmi on the left side. 10 *a.m.*: Eserine 1 gr. and pilocarpine ½ gr. hypodermically; no result. Ammon. carb. 1 oz. and pulv. nucis vom. ½ oz., three times a day. Temperature, 6 *p.m.*, 102.8° F.

October 7, 1910.—Still in pain, temperature 101.6; pulse 48 and weak; continually up and down, but never violent; pain continues and subacute. 12.30 *p.m.*: Eserine 2 gr. and pilocarpine 1 gr. hypodermically with no result, continue ammon. carb. and pulv. nucis vom.

October 8, 1910.—Looks brighter, a little fæces passed, marked borborygmi on the right side, very slight on left, in less pain; continue ammon. carb. and pulv. nucis vom., enemas, abdominal massage.

October 9, 1910.—Standing quiet, head down, a little fæces passed containing a large proportion of undigested oats.

October 10, 1910.—Temperature 100, pulse weak, feeding a little, ol. lini. 1 pint, spts. ætheris nit. ½ oz. given; animal taken out for a short walk, stands quite quiet in the box.

October 11, 1910.—Relapse this morning, off feed, dull pain again, urine passed in small quantities and often. Aloes 5 drachms, in solution with tr. zingib. ½ oz., water 1 pint, given, enemas. 12.30 *p.m.*: Small quantity of soft fæces passed, animal quiet during the afternoon.

October 12, 1910.—In much pain, temperature 102, pulse 52 and very weak, conjunctivæ deeply congested. At 11.30 *a.m.*: barium chloride 10 gr. given intravenously in ½ drachm water; after twenty minutes animal in great pain, powerful tenesmus at frequent intervals causing partial eversion of the rectum, but no fæces passed. 2 *p.m.*: 1 oz. chloral hydrate given, which controlled the tenesmus. Animal in dull pain all the afternoon. 6 *p.m.*: Morphia injection given, 4 gr. morphia. 7 *p.m.*: Animal lying down and easy.

October 13, 1910.—Much brighter, passed a little watery ingesta, warm soapy enemas given, abdominal massage, linseed tea as a drench.

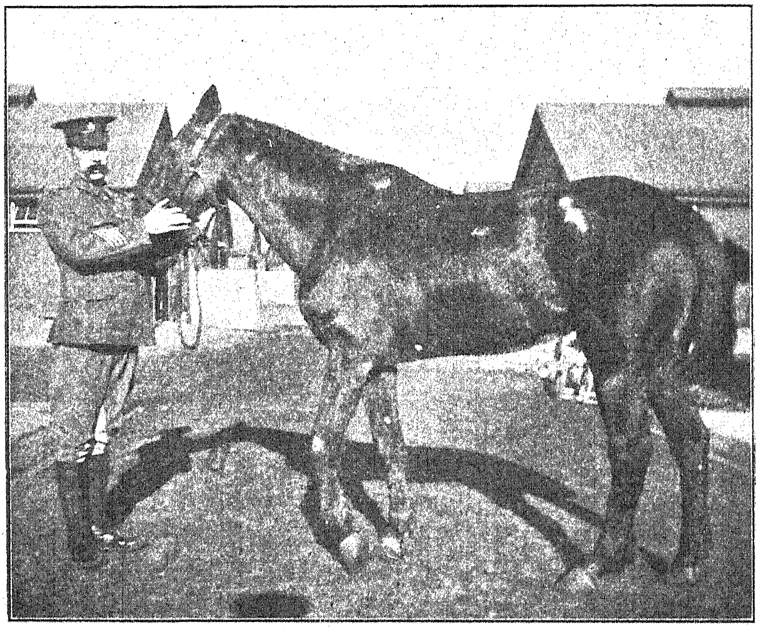
October 14, 1910.—Very dull again, a small quantity of pultaceous fæces passed, linseed tea, carrots, and a small quantity of green grass given.

October 15, 1910.—Still dull, but more borborygmi audible on left side, no fæces passed, urine passed in larger quantities and not so frequent.

October 16, 1910.—About the same; small quantity of fæces passed, tr. nucis vom., tr. gentian. co., spts. ætheris nit. 1 oz. each, and aqua 1 pint given.

October 17, 1910.—Eating a little mash, turned into paddock for a short time, grazes a little. Passed a shovelful of fæces, half of it blood-stained, the remainder normal in appearance, tinged green from the grass, animal very weak and dull; continue the medicine given on 16th, three times a day.

October 18, 1910.—At 8 *a.m.* the animal was standing in the box with head drooping, hanging from the rectum was seen a dark stringy mass about 2 ft. in length, a shovelful of greenish-coloured soft fæces was passed and the mass came away with it; upon examination it was found to be a cast of the intestines in a gangrenous condition. About half an hour later another quantity of fæces was passed, patient improved, pulse stronger and fuller, temperature 99.5, warm mashes with linseed, and steamed hay given, sent to graze for a short time in the morning, stimulants and tonics continued.



Photograph of patient showing lameness of near fore-limb on November 11, 1910.

October 19, 1910.—A quantity of fæces passed, eating mash well, animal very weak and tucked up; continue stimulants and tonics.

October 20, 1910.—Improvement maintained, large quantities of fæces passed.

October 25, 1910.—Fæces passed normal in quantity and appearance, animal still very weak.

October 30, 1910.—Animal bright and feeling well, noticed to be continually resting the near fore in a position similar to

that seen in a case of radial paralysis, and occasionally paws with the leg.

November 14, 1910.—Still rests near fore, pawing more persistent, carries limb.

November 23, 1910.—Marked atrophy of the anterior and posterior spinalis, spine of scapula and point of shoulder stands out prominently: evidently this condition is the result of an injury sustained when knocking about in the box during the periods of acute pain. *Treatment*: Massage and stimulating liniment, exercise. Bad bed-sores resulted from lying down and bruising when rolling; they are healing well.

November 30, 1910.—Much improved, trotting fairly well, atrophy still marked, general condition good considering the severity and length of the illness.

December 20, 1910.—Animal has suddenly gone lame on the off fore, symptoms same as seen in near fore; same treatment. Does not improve in condition, hide-bound and harsh coat; special diet: boiled food, &c., and tonics.

January 11, 1911.—Trotting nearly level, no sign of atrophy has appeared during the period of lameness on the off fore. Massage and exercise.

February 12, 1911.—Animal sound, condition much improved, discharged for a period of light work, then gradually brought into ordinary work.

REMARKS.

Intestinal cases often pull through in an extraordinary manner, this case appeared so hopeless at various stages that recovery seemed almost out of the question.

There was practically no action of the bowels for fourteen days, and during that period it was often difficult to know what line of treatment to adopt. I relied on the stimulating treatment and only gave barium chloride as a last resource, its action was so violent and ineffective that I should not use it again under similar circumstances.

The sudden lameness in the off fore was peculiar and unaccountable.

Recovery was perfect; the animal has been in regular work since March, carries good condition, and shows no signs of the severe illness.

The photograph shows the condition of the animal on November 11, 1910.

THE DIAGNOSIS OF BOWEL TROUBLES AS REGARDS ITS TERMINAL PORTION.

By G. MAYALL, M.R.C.V.S.
Bolton.

It has been stated by those inclined to take a somewhat pessimistic view of all our powers of diagnosis that as regards bowel affections everything may be put on a guess-work plane. In many cases, however, I think that a pretty sound diagnosis can be given as to the seat of trouble in stomach ailments of the horse, and as regards the rectum I am certain that such is the case, for what one can feel or touch certainly helps one. Quite recently I was called to a pony said to be affected with colic. On passing my hand into the rectum a rupture of its floor was at once detected. On July 19 I was called to a chestnut cart mare with colic. The usual anodyne draught was given and the rectum, greatly contracted, was explored. An enema was given but did not pass in any distance, in fact, about a quart of fluid was returned as fast as it was put in, indicating an obstruction not far from the anus. A diagnosis was given of strue or fæcal concretion close to the entrance of the rectum. The mare lived until June 23, and notwithstanding that the rectum was frequently explored and oleaginous enemas and draughts given, the obstruction did not come near enough to the hand to be removed. (I have previously removed concretions from rectum in two cases with happy results.) On *post mortem* a stone with a roughened surface was found just beyond reach of the hand. It measured half a foot through, was circular in form and weighed 6 lb.

I have noticed symptoms in two recent cases of peritonitis that do not appear to be mentioned in any text-book; in fact, peritonitis *per se* does not seem to be recognized as a disease of the horse in above one text-book. The symptom I refer to is alternate lifting of the hind legs and carrying them out so that if one stands near the hip of the patient one offers a good chance of getting kicked.

One of these cases followed an acute attack of lymphangitis and the other constipation (with colicky pains) and rubbing of salt on the vagina by a wiseacre.

FRACTURE OF THE TIBIA.

BY W. CAUDWELL, F.R.C.V.S.
Chertsey, Surrey.

ON Saturday morning last I was asked to examine a nag mare as to lameness. She had been driven two short journeys the same morning, and on returning home the second time she slipped on an iron inspection cover in the road, and suddenly fell lame on the near hind leg. I examined the limb and foot and could detect no evidence of pain or flinching except in the hock, which was the seat of a big old bone spavin. My advice was to place her in a loose box and apply hot fomentations to the hock. Slinging was impracticable, as she was heavy in foal and due to foal in three weeks hence. The following morning I received a telephone message asking me to see her again, as they thought her leg was broken. I found her lying down on the off side, and the deformity of the near hind limb at once indicated that a fracture of the tibia with displacement had occurred. The animal was forthwith destroyed. A *post-mortem* examination disclosed a comminuted fracture extending across the grooves and malleoli of the tibia, and half way up the shaft of the bone. Also an oblique fracture extending from the upper part of the ridge of the bone in an oblique direction downwards and backward, and some intermediate smaller fractures.

It appears probable that the fracture at its articulation with the astragalus happened when the mare slipped, on returning home, and that the other fractures and displacement occurred in lying down during the same night.

FRACTURE OF THE OS SUFFRAGINIS.

BY CAPTAIN A. J. WILLIAMS, F.R.C.V.S., A.V.C.
Mounted Infantry School, Longmoor, Hants.

Subject.—M.I. cob, aged 10 years.

History, &c.—The cob was being ridden at a trot down a sandy lane, the groom felt the mare strike herself. She stumbled badly and almost came down; the groom jumped off at once and found the pastern broken.

The mare used to strike herself occasionally and go slightly

lame for a few strides. She was specially shod and was wearing brushing boots when the accident happened.

Post-mortem Appearances.—A comminuted fracture, the bone being broken into thirty pieces.

The pieces of the fractured os suffraginis.

It appears to have been split into several segments vertically, the posterior one being the largest.

The anterior segments were vertically cleft, also broken transversely into a large number of pieces of varying size.

A peculiar feature of the fracture is that whereas the posterior segment of bone is practically intact from top to bottom, the anterior part of the whole bone is split up into numerous pieces.

I am indebted to Major A. C. Newsome, A.V.C., Professor, Army Veterinary School, Aldershot, for the photograph.

THREE CASES OF ABNORMAL RETENTION OF THE FŒTUS.

By W. CAUDWELL, F.R.C.V.S.
Chertsey, Surrey.

Case 1.—On July 17, 1908, I was requested to examine a Jersey cow, which was due to calve a month previously. She was apparently in good health, but had not the appearance of an in-calf cow. No fœtus could be felt by external examination, and the os uteri, I found, was firmly closed. On examination per rectum I discovered that the uterus contained something hard. I advised that she should be kept under observation to notice whether she passed a fœtus.

On September 7 (about twelve weeks after the normal term of gestation had expired) the cowman noticed at 7 a.m. that she was uneasy, and straining a little, and a discharge escaped from the vagina. About five hours later she ejected two mummified fœtuses in their membranes. I advised that she should not be served again until three or four months had elapsed. That advice was acted upon, and about October, 1909, and again in 1910, she gave birth to a full-term heifer calf, and the cow and her progeny continue in good health.

Case 2.—On June 14, 1906, I was asked to attend a Jersey cow, 7 years old. She was straining frequently and severely, and passed thick mucus from the vagina. She was due to calve three months previously. External examination failed to detect a gravid uterus. Exploration per vaginam found the os uteri firmly closed, and no fœtus could be discovered. The pains gradually subsided under treatment, and in a few days ceased entirely.

On the 23rd of the same month she showed signs of œstrum, and was taken to and received the bull. The same afternoon

she expelled a mummified fœtus which evidently had been dead a long time.

I may add that about Christmas, 1905, when she was six months gone in calf, complaints were made about her milk having a bitter taste. Probably death of the fœtus had occurred prior to this and may have been responsible for the bad flavour of the milk.

Case 3.—An in-foal Shire mare, which was turned out in a meadow, having gone her full time showed signs of foaling and was brought into a loose-box, where she speedily gave birth to a fully developed dead foal. Coincident with this event, near a gate in the same meadow was found a small equine fœtus, which had apparently died about the seventh or eighth month of gestation. It is supposed that the mare had given birth to it also, as she was the only pregnant mare on the farm. About the end of the previous year the mare suffered slight colicky pains, so assuming that she was the parent of both, it seems probable that one fœtus died about that time and was retained the full term of gestation.

THE TREATMENT OF CONTAGIOUS GRANULAR VAGINITIS IN CATTLE.

By A. LASZLÓ.

Veterinary Surgeon, Füzesgyarmat, Hungary.

THERE is perhaps no disease of cattle which has caused such loss to the world as contagious granular vaginitis, and the abortion which used to follow it. It ruined the finest and the best herds, and experiments in the treatment and cure of the disease have not been very successful.

I have read most of the various remedies of this disease in English, German, and Hungarian veterinary literature, but none of them have shown such good results as the experiment which I have carried out with "Bissulin," made in Aachen, Germany, by H. Trommsdorff. "Bissulin," is a hydrargyrum preparation. It is made, for cows in the form of a cone, for bulls in the form of a stick.

I was called to a farm in the summer of 1909, where in a herd containing 95 cows and 3 bulls, 31 of the cows had aborted in four

weeks. The cause of the abortion seemed to be contagious granular vaginitis. The phenomena of the disease are well known, and I will not deal with them.

The whole herd was diseased. I treated the animals with lukewarm solutions of creolin 2 per cent. Irrigation was carried out once daily and after one week there seemed no improvement.

Then I commenced to treat the animals with "Bissulin." After having cleansed and disinfected the external genitals, tail and hindquarters, I irrigated the vagina with a solution of English creolin 1 per cent. After irrigation I rubbed the whole vaginal canal with a "Bissulin" cone; and I left what remained of the drug far in the vaginal tract. The bulls had "Bissulin" sticks applied to the penis. I did this during the first week once a day. During the second week I applied treatment once in two days. During the third and fourth week once in three days.

The result was, that the three bulls and six cows made no improvement, and they were thrown out of the breeding herd. In the vagina of the rest of the cows (89) there were no granules, nor was the bright red colour to be seen. After the fourth week each cow received four irrigations spread over a fortnight, and one "Bissulin" cone after every irrigation. Thus the cure takes altogether six weeks, with twenty "Bissulin" cones for every cow. As a result of this the contagious vaginitis was cured. The cows have copulated and after that have had no irritation. In the next year only four of the cows aborted. These were removed from the herd, and in the present year there has not been one abortion. I must not omit to mention that the most profound disinfection of the cowshed was carried out by me first of all.

In last March there was contagious vaginitis in another herd of 79 cows and 2 bulls. I threw out of the breeding 11 aborted and badly diseased cows and the 2 bulls. I treated the rest of the cows with the described method. Every one of them was cured and copulated. There is no irritation among them up to this day.

On account of the simplicity of the handling of the disease, and for the results which I have arrived at, and on account of the cheapness of "Bissulin," I offer it to my English confrères.

REMOVAL OF BOTH ABDOMINAL TESTICLES FROM A CRYPTORCHID THROUGH ONE INCISION.

BY FREDERICK HOBDAY, F.R.C.V.S.
Kensington, W.

ON May 4 last I was called in consultation by Messrs. Ross and Johnson, M.R.C.V.S., of Belfast, to operate upon a cryptorchid colt, 4 years old, neither of whose testicles had been removed. Nothing could be felt upon digital examination, either when the animal was cast or chloroformed, and the testicles were eventually found in the abdomen. The operation was performed in the usual way in the inguinal region, with the exception that upon gaining entrance into the abdomen through the left flank close to the inguinal canal I made a search for the right testis (after removing the left one) through the one incision I had just made. Upon passing my hand across the abdomen I found it without difficulty and upon attempting to withdraw it discovered that it had a sufficiently long spermatic cord to enable it to be brought sufficiently into view for the loop of the ecraseur chain to be placed over it. Removal was effected without difficulty, and the recovery of the patient uneventful.

The chief interest in the case lies in the fact of both testicles being able to be removed through the one incision, as such a course must of necessity, when able to be adopted, diminish the chances of wound infection.

At the same time the cord is usually so abnormally short that such a course is not possible, and although I have made the attempt on numerous occasions I have never before had the good fortune to be successful.

Canine Clinical Note.

A CASE OF HODGKINS' DISEASE.

BY FREDERICK HOBDAY, F.R.C.V.S.,
Kensington, W.

THE subject was a very small Japanese bitch, aged 5 years, which had been in the close possession of the owner as a great pet for about three years. About the middle of January the owner noticed that she occasionally had fits of weakness, especially after swallowing food, and in February the glands of the neck and just behind the angle of

the jaw were slightly swollen, but not at all painful. At the end of the month I was consulted and upon further examination of the body detected swellings in the glands of the groin and under the axillæ. There were now slight attacks of weakness and discomfort, and by the middle of March the glands had enlarged very considerably, averaging about the size of a Barcelona nut. Diagnosing the case as one of Hodgkins' disease, and therefore hopeless, I advised the owner to allow her to be painlessly put away.

This was done, and the body was sent to the Royal Veterinary College, where Sir John McFadyean made a *post-mortem* examination, and confirmed the diagnosis, stating that it was a typical case.

The rarity of this condition in canine patients makes the case worth recording.

WHITEWASH FOR COWSHEDS.

Part of the regular work on a dairy farm should be the periodical whitewashing of the cowsheds, pails, milkroom, &c., and the oftener this is done the better. The best and quickest way of applying the whitewash is by means of a spray pump, many of which can now be cheaply obtained. The following directions for preparing whitewash are taken from a bulletin of the Illinois Experiment Station: "Take a half-bushel unslaked lime of good quality, slake it with boiling water (cold will do), cover during the process to keep in steam, and add water as the process goes on. To do this the lime should be placed in a tight barrel and water enough added to partly cover the lime. Never cover the lime entirely with water, else the slaking process will go on too slowly. Soon after the water is added the lumps of lime, which are exposed to both air and water, begin to crumble, and soon the whole mass begins to steam. More water should be added, and the barrel kept covered. After the slaking process is over several pails of water should be added, and the whole thoroughly stirred. This mixture should be strained through a fine sieve before placing in the barrel to which the pump is attached, and, if necessary, more water may be added to secure a mixture which the nozzle will deliver well. The contents of the barrel or bucket must be kept well agitated, for the lime tends to settle upon the bottom. The spray must be fine and not allowed to play upon one place until the wash begins to run. When applied with brushes a slightly heavier wash can be used, as it is generally well rubbed down. Light coats frequently applied are better than heavy ones, as the latter are more apt to scale off. While still wet a light coat seems to have failed in its object, but when dry the whole becomes perfectly white. One bushel of lime will make 30 gallons of whitewash. Many formulas for making whitewash are published, involving the use of salt, oil, grease, rice, &c., together with the boiling of material at different stages of its preparation. These are too much involved for the ordinary man, besides taking too much time.

THE PRESIDENT OF THE NATIONAL VETERINARY ASSOCIATION.

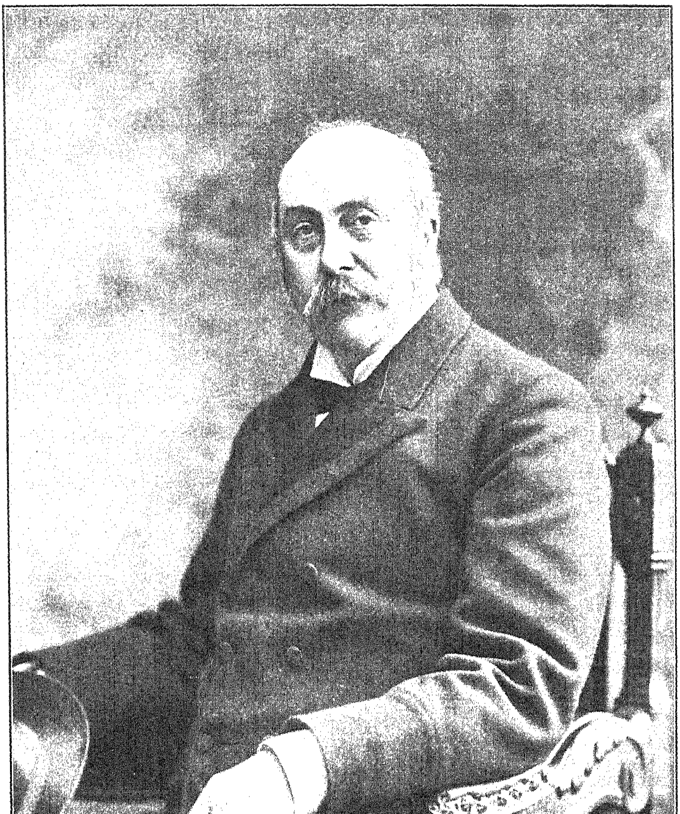
Thomas Salusbury Price, Esq., M.R.C.V.S.

We think we can say without fear of contradiction that there was never a more popular President of the National Veterinary Association than Mr. T. Salusbury Price, who has been engaged in presiding over this year's very important meetings. His genial presence and modest good humour are infective and it is always a great pleasure to be brought into contact with him. There is no doubt that his great success in his enormous London practice is largely due to these qualities, together with his conspicuous professional ability and tactfulness. Some men are born veterinary surgeons, and Mr. Price is one of them.

The President of the National Veterinary Association was the son of a veterinary surgeon, Thomas Salusbury Price, a Welshman, who was amongst the earliest of the graduates of the Camden Town school, and who over a century ago was granted a commission in the militia for the County of Carnarvon, in the time of His Majesty King George III, and subsequently fought in the battle of Waterloo. The warrant granting that commission is one of the President's most treasured possessions. Mr. Price was born in London, but spent much of his early boyhood in North Wales, and it is particularly fitting that he should be at the head of affairs the year the National meets at Carnarvon, since he springs from a Carnarvonshire stock.

Mr. Price studied at the Royal Veterinary College, London, and obtained his diploma in 1868, and settled down to practise in South London. In 1872 he married Emma, daughter of Robert and Emma Sabberton, of Cambridge. He became a member of the National in its earliest days and has been associated with it ever since, and he and Mrs. Price, who died in 1906, were constant in attendance at the annual functions. Mr. and Mrs. Price had three daughters, one of whom died young. The other two apparently would not forsake the profession in which they were practically reared, for they both married veterinary surgeons. One of these is the wife of Mr. Herbert King, who is a partner with his father-in-law. The other, a year or two ago, was married to Professor Wooldridge, of the Camden Town College, and is a regular visitor at the National.

Mr. Price, though still a busy practitioner, has found time to indulge in his hobby of farming, and he has a large model dairy farm in Surrey. (We wonder whether he makes it pay!) In addition he is one of those unassuming philanthropists who go about doing an enormous amount of good in a very quiet way. He is a life subscriber to the Victoria Veterinary Benevolent Fund, and has lately made additional donations to the fund. He is a regular contributor to numerous charitable institutions such as orphanages and the Royal Blind Pension Society,



MR. THOMAS SALUSBURY PRICE, M.R.C.V.S.
President of the National Veterinary Association, 1911.

and no deserving case of which he has any personal knowledge ever appeals to him in vain.

In matters veterinary he retains the liveliest interest. He was a conspicuous success as President of the Central Veterinary Society last year, and only a week or two ago he was announced by Sir John McFadyean as being one of those who had promised to give £100 to the fund for the entertainment of the International Veterinary Congress in 1914.

Abstracts.

ABSTRACT FROM THE FINAL REPORT OF THE ROYAL COMMISSION ON TUBERCULOSIS.

To The King's Most Excellent Majesty.—May it please your Majesty, we, your Majesty's Commissioners, appointed to inquire and report with respect to Tuberculosis :—(1) Whether the disease in animals and man is one and the same ; (2) Whether animals and man can be reciprocally infected with it ; (3) Under what conditions, if at all, the transmission of the disease from animals to man takes place, and what are the circumstances favourable or unfavourable to such transmission.

Three previous Reports have been issued by us. In the first (1904) the results of our preliminary investigations were discussed, and it was shown that the bacilli found in the lesions of certain cases of human tuberculosis produced in cattle a disease indistinguishable from bovine tuberculosis.

In our second Interim Report (1907) we dealt at some length with bovine and human tuberculosis and embodied in it the results obtained up to that date in the investigation of the characters of the bacillus of bovine tuberculosis and of the bacilli found in cases of human tuberculosis.

In the Third Interim Report (1909) we dealt with certain conditions of the tuberculous cow which rendered her milk infective.

Since the Second Report was presented we have continued our investigations into tuberculous disease of man and of the ox, and have also studied the tuberculosis which occurs in pigs, horses, some other mammals and birds. In this our final Report we propose to deal with the whole of our inquiry into the tuberculosis of all these various animals.

Our investigation has included the isolation of the bacilli from the lesions of the natural disease, the investigation of the cultural characters of the bacilli isolated and the study of their effects when introduced into different animals in varying doses and by several methods.

The species of animals used in this study have been cattle, rabbits, guinea-pigs, pigs, goats, chimpanzees, monkeys, horses, rats, mice, dogs, cats and birds. The experimental methods of infection employed have been subcutaneous, intravenous and intraperitoneal inoculation, and feeding. We have not attempted to infect by means of inhalation.

The experimental method of investigation we have adopted was essential in order to compare the characters of the bacilli isolated from the tuberculous lesions in different species of animals; without it we should not have been able to give any answer to the questions referred to us.

We have necessarily made ourselves acquainted with the results published from time to time by others engaged in the study and experimental investigation of tuberculosis, but the conclusions arrived at in this Report are based solely on our own researches.

Three Types of Tubercle Bacilli.

For purposes of description it is advantageous to distinguish three types of tubercle bacilli, recognisable by their individual characters. These are the human, bovine and avian types. The human type, although so named, is not the only one found in cases of tuberculosis in man. It is the organism present in the majority of such cases, but in some cases of the human disease the bacilli present are of the bovine type, and in others the bacilli have special characters distinguishing them from each of the three principal types. In natural cases of tuberculosis in cattle the only type of bacillus present is the bovine type.* Similarly, in cases of natural tuberculosis occurring in poultry the bacillus belongs to the avian type.

The relationship between these three types of tubercle bacilli will be the subject of discussion later in this report. At present only the individual characters of the three types will be described.

(A)—The Bovine Tubercle Bacillus.

It will be convenient to take the bacillus of bovine tuberculosis as a standard for comparison with the bacilli found in the tuberculosis of other animals. The characters and properties of this bacillus have already been discussed in the Second Interim Report (2nd Int. Rep., page 6 *et seq.*) and it is unnecessary here to repeat many of the facts there recorded. But a summary of its behaviour will facilitate comparisons to be instituted between it and the bacilli of the tuberculous lesions of animals other than the bovine.

(*a*) *Cultural Characters.*—The bovine tubercle bacillus grows slowly on serum and at the end of two or three weeks shows on the surface of the medium a thin greyish uniform growth, not wrinkled and not pigmented.

(*b*) *Effects on Animals.*—The bovine tubercle bacillus produces characteristic effects when inoculated in certain doses into calves and rabbits, and it is these effects, taken with its mode of growth in artificial cultivation, that enable it to be recognised as such.

In calves the subcutaneous injection under the skin of the neck of 50 milligrammes of a culture of bovine tubercle bacilli not older than three weeks produces generalised tuberculosis starting from the point

* In a calf inoculated subcutaneously with bacilli of the human type (H 79 JN), the avian bacillus was found in a nodule in a mesenteric gland. (Appendix Vol. I. Calf *1225*, p. 375.)

of inoculation and ending fatally usually within eight weeks. The local lesion is a mass of caseous tubercle, infiltrating the adjoining skin and muscle, and sometimes forming an abscess. The prescapular gland is a mass of caseous tubercle, as is also the prepectoral gland, and as are also to a less but variable extent the thoracic and mediastinal glands. Tubercles more or less caseous are found in very many, sometimes in all, the other lymphatic glands. The lungs, spleen, liver, and also the kidneys are studded with tubercles, many of them caseous. Tubercles are found in the pleura, on the omentum, on the peritoneal surface, and in the intestinal walls.

The injection of this dose of the bovine tubercle bacillus causes severe general tuberculosis in the calf, and it is the result in this sense which we have taken as a standard of virulence for comparison with that of the other bacilli investigated.

In rabbits generalised tuberculosis ending in death within five weeks resulted from the intravenous inoculation of 0·01 or 0·1 of a milligramme of culture of bovine tubercle bacilli. With intraperitoneal injection in doses of 0·1 and 1 milligramme the duration of life was from 13 to 48 days, and 10 to 38 days, according to the dose, but with subcutaneous inoculation of doses of 10 milligrammes and 1 milligramme the duration of life was longer—28 to 101 days, and 29 to 165 days, according to the dose.

The results produced by injecting the bovine tubercle bacillus into calves and rabbits in the above doses are thus very striking and definite, and taken with the cultural characters of the bacillus afford a trustworthy means of recognising the bovine tubercle bacillus. Indeed, as our investigation progressed we found that it was sufficient to inoculate rabbits for differential diagnosis; for if an undetermined culture produces severe generalised disease in the rabbit within the period mentioned and by the doses referred to, administered in the various manners described, the same culture should produce an acute tuberculosis in the calf in doses of 50 milligrammes of culture subcutaneously inoculated.

Other properties of the bovine tubercle bacillus may be mentioned. It invariably produces acute tuberculosis in the chimpanzee, monkey and guinea-pig, by subcutaneous inoculation in very small doses. In the goat, pig and cat generalised tuberculosis is also readily induced by it. Indeed, the results of an adequate dose in the goat, pig and cat have an equal value with those obtained in calves and rabbits in differentiating the bovine tubercle bacillus from the tubercle bacillus found in other kinds of tuberculosis. The rat and mouse are highly resistant to the subcutaneous inoculation of the bovine tubercle bacillus, but after intraperitoneal inoculation the tendency is for the bacillus to multiply in the body and to be present in large numbers in the organs, even in the blood, without causing the formation of tuberculous lesions such as are produced in animals susceptible to the bovine tubercle bacillus. The dog is highly resistant to the subcutaneous inoculation of the bovine tubercle bacillus, but may succumb to general tuberculosis when large doses are inoculated intravenously or intraperitoneally.

In the fowl, the bovine tubercle bacillus injected intravenously causes death in about half the number of cases, usually with wasting

of the bird, œdema of the lungs and pallor of the liver. In some cases the lungs show definite tubercles and the liver shows minute necrotic areas. Death is apparently caused by the toxic effect of the bacilli, as dead tubercle bacilli intravenously injected will produce the same effects as living. When injected intraperitoneally or intramuscularly, even in large doses, bovine bacilli produce in fowls only a local lesion, without dissemination ot the disease.

In our experiments with horses the bovine tubercle bacillus in moderate doses did not produce progressive tuberculosis by subcutaneous inoculation or by feeding ; given intravenously in a dose of 10 milligrammes, it caused the death of the animal from acute tuberculosis in twenty days.

Stability in Culture.—We have not found that the bovine tubercle bacillus diminishes in virulence to any great extent when subcultured for long periods—in one instance for as long as 1487 days.

B.—Bacillus from Certain Cases of Tuberculosis in the Human Body.

The Human Tubercle Bacillus.

In our Second Interim Report (2nd Int. Rep., p. 14) we described the tubercle bacilli which we had found in cases of human tuberculosis and divided them into Groups (I, II, and III). Those belonging to Group I were proved to be identical with the bovine tubercle bacillus. The features of the bacilli of Group III were discussed, but final conclusions were not drawn by us regarding the significance of the somewhat anomalous results obtained. The bacilli of Group II had, however, definite characters and were obtained from the larger number of cases of human tuberculosis. This is the type of bacillus we have agreed to call the *human tubercle bacillus*, as it is the bacillus found in the majority of cases of human tuberculosis. What we stated in our Second Interim Report regarding this bacillus is confirmed by our further investigations. The chief characters of the bacillus are as follows :—

(*a*) *Cultural Characters.*—The human tubercle bacillus grows more rapidly than the bovine tubercle bacillus on serum, hence we have called it eugonic in contrast to the bovine bacillus, which is dysgonic. The growth tends to became wrinkled on glycerinated media, and becomes pigmented to a greater or less extent on all media.

(*b*) *Effects on Animals.*—It is in still greater contrast with the bovine tubercle bacillus when it is subjected to inoculation tests under the same conditions.

In calves, a subcutaneous inoculation of 50 milligrammes of a culture under three weeks old does not produce progressive tuberculosis in the animal, nor does it kill it. In the majority of instances the inoculation results in the formation of a local lesion, a larger or smaller mass, which may become a cyst, surrounded by a fibrous capsule : the lesion is thus retrogressive and localised. Lesions in the internal organs may occur, but these consist mainly of caseous or calcareous nodules in the lymphatic glands nearest the seat of inoculation, or of a few calcareous tubercles in various

internal organs. In about half the number of experiments performed with this bacillus in 50 milligramme doses on calves, tuberculous lesions did not extend beyond the nearest glands, no lesions being found in the spleen, liver, or kidneys. It is quite clear therefore, that the human tubercle bacillus possesses a much lower virulence for the calf than the bovine tubercle bacillus.

When inoculated into rabbits the contrast is also as a rule well-marked, so that, as previously stated, subject to certain precautions the rabbit test can be taken as a measure of virulence for calves; that is, if a bacillus is found slightly virulent for the rabbit it will be found slightly virulent also for the calf.

The above statement may be taken as generally correct. It has, however, been noted by Dr. A. Stanley Griffith that in certain cases intravenous inoculation of 1 milligramme or 0.1 milligramme of a culture of the human tubercle bacillus produced in rabbits an acute and rapidly fatal tuberculosis indistinguishable from that which was caused by the bovine tubercle bacillus, but that death from tuberculosis never occurred within three months when 0.01 milligramme was used as a dose, whereas such a dose of the bovine tubercle bacillus invariably produced a rapidly fatal tuberculosis in the rabbit. Dr. Griffith would therefore conclude that for the purposes of distinguishing between the bovine tubercle bacillus and the human tubercle bacillus by means of intravenous inoculation in the rabbit a dose of 0.01 milligrammes should be used. With subcutaneous inoculation it was found that a dose of 10 milligrammes or more was a suitable one for the purposes of differential diagnosis. Such a dose of the bovine tubercle bacillus causes the death of the rabbit from acute generalized tuberculosis in 28 to 101 days, whereas with the human tubercle bacillus death does not occur from tuberculosis, and the animals have been killed in periods varying from 94 to 725 days.

The goat and the pig are not to any great extent affected by the human tubercle bacillus. In both animals the inoculation of this bacillus leads only to a slight retrogressive tuberculosis. Pigs perhaps are slightly more susceptible than calves. Acute tuberculosis is produced in the chimpanzee, monkey and guinea-pig by the human tubercle bacillus. The effect in the chimpanzee and monkey is similar to that which follows inoculation of like doses of the bovine tubercle bacillus. In the guinea-pig, however, the average duration of life is longer when the human tubercle bacillus is inoculated than after inoculation with the bovine tubercle bacillus. In the rat and mouse injected intraperitoneally with large doses of the human tubercle bacillus the bacilli become disseminated over the body, multiply in the tissues and cause death without producing characteristic tuberculous lesions. In the dog the human tubercle bacillus behaves like the bovine tubercle bacillus, that is, the animal is highly resistant to subcutaneous inoculation, but may die of generalized tuberculosis after intravenous or intraperitoneal inoculation of large doses.

The cat is resistant to the human tubercle bacillus when this is given subcutaneously, intraperitoneally, intramuscularly or by feeding. A few tuberculous lesions have been produced by intraperitoneal

inoculation, but these were not widely distributed and did not affect the health of the animal.

In the fowl the effect of the human tubercle bacillus is similar to that of the bovine bacillus. In one experiment in a horse, the subcutaneous injection of 50 milligrammes produced only local disease.

Thus the human tubercle bacillus is distinguished from the bovine tubercle bacillus by its more ready growth on artificial media and by the results of its inoculation into rabbits, calves, cats, pigs and goats.

But both the bovine tubercle bacillus and the human tubercle bacillus are alike in that they readily produce tuberculosis in chimpanzees, monkeys and guinea-pigs, and in the circumstance that the lesions produced in these animals are the same in distribution and structure.

Stability in Culture.—The human tubercle bacillus has not shown any alteration in cultural characters on prolonged subcultivation.

C.—The Bacillus of Avian Tuberculosis.

Avian tuberculosis, as it occurs naturally in birds, is discussed in a separate section. In this place an account is given of the characters and properties of the avian tubercle bacillus as exhibited under experimental conditions for comparison with those of the bovine tubercle bacillus and the human tubercle bacillus.

(a) *Cultural Characters.*—The avian tubercle bacillus forms a slimy whitish growth, which is easily emulsified, thus contrasting with the growth of bovine and human tubercle bacilli. It grows especially well on glycerinated media.

(b) *Effects on Animals.*—The results of the inoculation of the avian tubercle bacillus into animals are in marked contrast with those obtained from inoculation of the bovine and the human tubercle bacillus.

Fowls are very susceptible to the action of the avian tubercle bacillus by intravenous, subcutaneous, and intramuscular inoculation, and by feeding. After inoculation there are tuberculous lesions in the spleen and liver, and frequently in the lungs, cervical glands, muscles, and bones. After feeding, the distribution of the lesions is the same, with the exception that characteristic tuberculous lesions are produced in the mucous membrane of the intestines.

The lesions produced by the avian tubercle bacillus in parrots do not differ from those produced in fowls; but the avian bacillus, when introduced by feeding, does not cause lesions in the intestines of parrots so constantly as in fowls. Parrots are susceptible to the action of both the bovine and human tubercle bacillus, and when either of these is given by inoculation or by feeding the lesions set up are similar to those produced by the avian bacillus, the bovine tubercle bacillus being apparently more virulent for these birds than either the human or the avian tubercle bacillus.

The rabbit and mouse are the only two mammals in which the avian tubercle bacillus causes progressive tuberculosis.

In the mouse, a generalised tuberculosis is produced by the avian bacillus, whether this is inoculated subcutaneously or intraperitoneally or is given by feeding.

The calf, pig, monkey, guinea-pig, horse, cat, and rat behave alike to the avian bacillus, which in them never produces a progressive tuberculosis, though it sometimes multiplies in the body and becomes disseminated in the tissues and may kill if a large dose is given intravenously. The adult goat reacts similarly, resisting subcutaneous inoculation and feeding, although it succumbs to the effects of intravenous injection of the bacilli. Young goats are rather more susceptible than adults. The chimpanzee, in the single experiment performed, was found to resist a large dose (50 milligrammes of culture) of the bacillus injected subcutaneously and no tuberculous lesion was found when the animal died three years afterwards. In the dog, large doses injected intravenously produce no effects.

Vitality in Culture.—The bacillus was found alive in culture after 1,067 days.

Chemical Properties of the Three Types of Tubercle Bacillus.

Dr. Harden was unable to detect any definite and constant biochemical character by which tubercle bacilli of one type can be differentiated from those of another.

Human Tuberculosis.

Cases of Human Tuberculosis other than Lupus.

Cases of Pulmonary Tuberculosis.—These fall into two series. In the first series (14 cases) a portion of the tuberculous lesion obtained at the *post-mortem* examination was used for investigation. In 13 of the cases this was the lung, in the other a bronchial gland only was used. In addition to the lung, a thoracic gland in one case, a cervical gland in a second case, a mesenteric gland in a third, and the spleen in a fourth, were investigated. These were clinically all cases of primary pulmonary tuberculosis, the disease which is commonly called consumption, in which the main and seemingly primary tuberculous lesion was in the lung, and in which death resulted from the pulmonary disease. In all these 14 cases the bacillus found was the human tubercle bacillus, and no evidence of the presence of the bovine tubercle bacillus was obtained.

The second series of cases included those in which sputum alone was examined. The sputum from 28 cases was used. The patients were usually young adults, and each case was investigated separately. To meet the possibility of the sputum being mixed with bovine bacilli derived from milk or butter the following precautions were taken :—Twenty-four hours before the collection of the samples of sputum the teeth and gums of the patient were carefully cleansed, and the mouth washed out repeatedly. Subsequently the patient was not allowed to take any milk or milk product until after the sputum had been collected. It was received directly into sterilized wide-mouthed bottles, and was then sent for investigation. Guinea-pigs were inoculated with the sputum and cultures obtained from

them. In two cases cultures were also obtained direct from the sputum.

The results of the investigation of these cases showed that the living tubercle bacilli present in the sputum in 26 cases were human, and in 2 cases were bovine. In none of the cases was there a mixture of bovine and human tubercle bacilli.

In three cases of *general tuberculosis*, the primary lesion of which could not be determined, and in three cases of *tuberculous meningitis*, in which the meninges and cerebro-spinal fluid were used for investigation, the lesions yielded human tubercle bacilli only.

Bronchial gland tuberculosis.—Five cases were examined. Three of these yielded human tubercle bacilli. Two others contained each a mixture of bovine tubercle bacilli and human tubercle bacilli. These two kinds of bacilli were separated and their characters investigated.

Nine cases of *cervical gland tuberculosis* in which the tubercle bacilli were obtained from specimens removed by operation were examined. Of these six yielded human tubercle bacilli and three bovine tubercle bacilli.

Primary abdominal tuberculosis, twenty-nine cases in all. Of these 14 yielded bovine tubercle bacilli, 13 human tubercle bacilli, and two cases were proved each to contain a mixture of bovine tubercle bacilli and human tubercle bacilli.

Of the total of 108 cases of human tuberculosis investigated 84 yielded human tubercle bacilli only, 19 yielded bovine tubercle bacilli only, and five both bovine and human tubercle bacilli. Although the bovine tubercle bacillus may, as it appears, be solely responsible for certain cases of pulmonary tuberculosis (consumption) and though it may be present with the human tubercle bacillus in the bronchial glands, it is evident from the data recorded that the majority of cases in which the bovine tubercle bacillus is the infective agent in the human being are cases of alimentary tuberculosis. Such are cases of cervical gland and primary abdominal tuberculosis. In the latter class of cases at least the tubercle bacillus has unquestionably been swallowed. Received in this way the tubercle bacillus, whether human or bovine, may pass through the pharyngeal or buccal mucous membrane and infect the cervical glands, or getting into the small intestine it may produce several different lesions such as ulceration of the gut, tuberculosis of the mesenteric glands attached and of the peritoneal covering. The percentage of these cases of alimentary tuberculosis due to the bovine tubercle bacillus is very large. Taking both classes of cases (cervical gland and abdominal) together, numbering 38, there are 17 in which the bovine bacillus alone was found, 19 in which the human bacillus alone was found, and two in which both were found. Taking the primary abdominal cases alone it is seen that in 16 out of 29 the bovine bacillus was found; in 14 of these it was the sole infective agent present.

Cases of Lupus.

Cases of lupus are considered separately from the other cases of human tuberculosis for the reason that they present certain divergent features of particular interest.

The cases of tuberculosis which have already been considered are those in which the disease affected the internal parts of the body; the internal organs, glands, joints or bone. In lupus the tuberculosis is usually limited to the skin. It runs as a rule a very chronic course, and is not commonly associated with internal tuberculosis. It may persist for many years without any sign of disease in the lungs or other parts of the body, and indeed even the lymphatic glands near the area of skin affected by lupus are not usually tuberculous.

The investigation was conducted with great care and completeness by Dr. A. Stanley Griffith. Twenty cases of lupus were examined.

In nine cases of lupus a bacillus was obtained presenting the cultural characters of the bovine tubercle bacillus. In only one case did the bacillus obtained from the original material possess the high virulent as well as the cultural characters of the bovine tubercle bacillus. The other eight viruses, though their bacilli exhibited and retained the cultural characters of the bovine tubercle bacillus, proved less virulent than that bacillus, not only for the calf and rabbit but also for the monkey and guinea-pig. It was found possible in two cases to increase the virulence of the culture from the original material by residence in the tissues of the calf and rabbit so as to bring it up to the high virulence of the bovine tubercle bacillus.

In eleven lupus viruses the original cultures manifested the cultural characters of the human tubercle bacillus. All these showed low virulence for the calf and rabbit, agreeing in this respect with the human type of the bacillus, though some of them exhibited for these animals much less virulence than that bacillus. They differed, too, from the human tubercle bacillus in that generally they had a lower, some of them a much lower virulence for the monkey and guinea-pig.

Swine Tuberculosis.

Tuberculosis is not an uncommon disease in swine, and the lesions from 63 individual cases were investigated. Four of these have to be excluded from consideration owing to the fact that cultures were not obtained. There remain 59 cases which were completely examined as regards the type of bacillus isolated from the lesions.

In swine the commonest method of infection is by ingestion of tuberculous material, and the parts first affected are the lymphatic glands in close relation to the alimentary tract (submaxillary, pharyngeal and mesenteric). The abdominal organs, especially the spleen, are not infrequently involved, and in many cases the organs of the thorax as well.

The specimens investigated were obtained in all cases from the slaughterhouse, and were taken from the carcases of animals sent there for the purpose of being slaughtered for food.

The cultures which were obtained from these were observed as to their mode of growth and were used for inoculation into guinea-pigs, rabbits, calves, fowls and other animals in order to determine the characters of the bacilli present, whether bovine, human, avian, or a mixture of these.

The results thus obtained are shown in the following table :—

Degree of Tuberculosis in the Pig	Bovine Virus	Human Virus	Avian Virus	Mixed Avian and Bovine	—
Local Tuberculosis ...	... 18 cases ...	3 cases ...	5 cases ...	— ...	26
Generalized Tuberculosis	... 32 ,, ...	— ...	—	... 1 case...	33
	50 cases ...	3 cases ...	5 cases	... 1 case...	59

The results of our investigation of Swine Tuberculosis are clear, and may be summarized as follows:—

All three types of tubercle bacilli are capable of infecting the pig, but the human bacillus and the avian bacillus are less frequently found in this animal than the bovine bacillus. The bovine tubercle bacillus, though in many pigs it may have caused no more than a localized lesion in the submaxillary lymphatic glands at the time of slaughtering the animal, nevertheless in many instances produces a severe and generalized disease. One case of mixed infection with bovine and avian tubercle bacilli was met with and a mixed infection with human and bovine tubercle bacilli must be considered possible in the pig, although it was not found in any of the cases investigated by us.

Equine Tuberculosis.

In horses tuberculosis is in most cases primarily an affection of the glands and organs in connection with the alimentary tract, the abdominal organs being chiefly affected. Five cases of equine tuberculosis were investigated. In one there were tuberculous lesions in the mesenteric glands and spleen; in a second case the mesenteric glands alone were affected; in a third case the spleen was the only tuberculous organ; and in two cases the mesenteric glands, spleen and lungs were affected, the disease having become generalized.

In three cases the material investigated was from the tuberculous mesenteric glands, in one case from the spleen, and in another case from the lungs, spleen and mesenteric gland.

In four cases the material was first injected into guinea-pigs and cultures were obtained from these animals; in one instance, the culture was obtained direct from the original material. In all cases the cultures obtained grew like those of the bovine tubercle bacillus.

The results of the experiments performed in testing the potency of the bacilli of these equine viruses show that notwithstanding the similarity of their cultural behaviour their virulence is not in all cases parallel with that of the bovine bacillus.

On the whole the properties of these viruses more closely resembled those of bovine tubercle bacilli than those of the other two types of tubercle bacilli—the human and the avian.

Question of Modification of Bacilli.

In the front portion of this Report we have set out the special characters of the tubercle bacilli commonly found in bovine animals, man and birds, and for convenience in describing the results of our investigations we have termed them respectively the bovine, the

human, and the avian type of tubercle bacillus. The three types are to be distinguished from each other by their cultural characters and by the effects of their inoculation into various animals. Distinction cannot accurately be made between these types on the basis of microscopic character alone. Morphologically mammalian tubercle bacilli, from whatever source derived, are uniform in character when grown on serum. The microscopical characters of mammalian bacilli were described in our Second Interim Report, pp. 25 and 26.

Avian tubercle bacilli when grown on glycerin-serum are generally very short (·5 to 1μ) and rather thick, often looking like cocci. Other media commonly yield longer and more irregular forms; and such forms are also sometimes found on glycerin-serum. Amongst these irregularities is found every counterpart to the irregularities observed amongst mammalian bacilli; and, in addition, large club-shaped thickenings are common and branching occurs more frequently than with the mammalian bacillus. In films obtained from emulsions of cultures it is noticeable that avian bacilli are generally distributed; they do not present the solid clumps of closely adherent bacilli which are characteristic of mammalian tubercle bacilli. When growing freely in the tissues the avian bacillus is short, straight, and uniformly stained; when growing under difficulties it is longer and more irregularly stained, and is indistinguishable from mammalian bacilli growing under similar adverse conditions.

To the difficult question of fixity of type of bovine, of human and of avian bacilli, we have given much time and attention. There is here involved a problem of much complexity, the facts bearing on it being not only voluminous but in certain senses conflicting, and we have had to regard the problem broadly from two points of view.

First we have had to inquire:—

Whether *as regards naturally acquired tuberculosis* evidence is forthcoming of modification, in any sense great or small, in the ordinary animal body, of any particular type of tubercle bacillus—bovine, human or avian?

And, *secondly* we have had to ask ourselves whether *under experimental conditions* any, and, if so what, modification can be induced, and in this connection we have experimented as follows:—

We have—

(*a*) Submitted the several types of bacillus to a series of cultural processes;

(*b*) Submitted them to long sustained influence of the living tissues of the animal body.

These particular experiments (detailed in the Report) failed to effect any modification in the bovine or human tubercle bacillus.

As regards experiments directed to modify the virulence of the avian tubercle bacillus similar negative results were obtained.

In cases of internal human tuberculosis we found a certain number which showed a mixture of human and bovine tubercle bacilli, and in the pig there was one case in which there was a mixture of bovine and avian tubercle bacilli. When separated, the bacilli from these cases were found to correspond in their characters to the bovine, human and avian types. Although it might be urged that the mere finding of the two types in a lesion indicated the

occurrence of a process of modification in one or other type, yet we found no transitional types in the lesions of internal tuberculosis in the human being, nor in the pig any but doubtful suggestion of such transition. The only variations from the three types which we have found in our extended investigations have occurred in cases of lupus and in equine tuberculosis.

Consideration of the Results in Relation to the Terms of Reference.

The questions that were referred to us for investigation and report are as follows:

"Whether the disease in animals and man is one and the same?

Whether animals and man can be reciprocally infected with it.

Under what conditions, if at all, the transmission of the disease from animals to man takes place, and what are the circumstances favourable or unfavourable to such transmission?"

First Term of the Reference.

The first question is:—Whether tuberculosis in animals and man is one and the same?

We have always found that guinea-pigs, chimpanzees and monkeys are all highly susceptible to the effects of either the human or the bovine tubercle bacillus and that the disease produced in these animals by both types is histologically and anatomically identical.

Obviously it has not been permissible to induce tuberculous disease experimentally in the human subject by the injection of bovine tubercle bacilli, and no opportunity presented itself to us of examining any case of accidental infection in which the bovine tubercle bacillus entered the human body through the skin and set up a generalized disease. But we have investigated many instances of fatal tuberculosis in the human subject in which the disease was undoubtedly caused by a bacillus of the bovine type and by nothing else. We have compared the lesions from such cases with those obtained from parallel cases of fatal tuberculosis in which the human tubercle bacillus alone was discovered. Except for the difference in the type of bacillus found in them, these two groups of cases presented similar features; the clinical histories of the patients were alike, the cases all terminated fatally, and the lesions examined after death were found to be anatomically indistinguishable. Man must therefore be added to the list of animals notably susceptible to bovine tubercle bacilli.

Chief among the differences between bovine and human tubercle bacilli is, of course, difference of virulence towards certain animals. Why, it may be asked, is the human bacillus, though as virulent for the monkey and the guinea-pig as is the bovine, far less virulent than that bacillus for the calf, goat, and pig? Is the human bacillus a bovine bacillus which, through some cause or combination of causes, has become modified, and, if so, is its degradation in this sense permanent?

We have recorded our repeated attempts to transmute the bovine bacillus into the human bacillus and *vice versa.* Most of these attempts failed altogether, a few only were equivocal; we found indeed that under the conditions contrived by us both types of bacilli remained remarkably stable, alike as regards their growth on artificial media and their virulence for animals. Thus, we are inclined to regard transmutation of bacillary type as exceedingly difficult if not impracticable of accomplishment by laboratory procedure, though in view of certain instances in which we obtained from one and the same human body both types of bacillus, we are not prepared to deny that the transmutation of one type into another may occur in Nature.

With respect to the question of the stability of the pathogenic properties which distinguish the two types, we must again refer to the exceptional characters possessed by certain of the bacilli which were isolated from cases of lupus and equine tuberculosis. In some of these cases the bacilli had the ordinary cultural characters of the bovine type, associated with a degree of virulence for the calf and rabbit no greater than is usually exhibited by the human type. We have already given reasons for declining to accept these exceptional bacilli as distinct fixed types, and if that view of them is excluded they must be regarded as either modified human or modified bovine bacilli. On the former assumption they had acquired the character of growth ordinarily exhibited by the bovine type, and on the latter assumption they had lost the higher degree of virulence for certain animals which is characteristic of the bovine type. The latter appears to be the more probable explanation, and if that view be accepted the discovery of these exceptional bacilli makes it impossible to regard difference of virulence for the calf and rabbit as sufficient to establish the non-identity of the human and the bovine types.

There would therefore remain only slight cultural differences on which to found the conclusion that the human and the bovine types represent two distinct organisms. We prefer to regard these two types as varieties of the same bacillus, and the lesions which they produce, whether in man or in other mammals, as manifestations of the same disease.

But while we regard the point which we have just considered as one concerning which there is room for difference of opinion, there is an aspect in which tuberculosis in men and in cattle must unquestionably be pronounced one and the same disease. Whether one prefers to regard bovine tuberculosis and the cases of tuberculosis in man which are caused by the human type of bacilli as varieties of the same disease or as independent diseases, there can be no question that human tuberculosis is in part identical with bovine tuberculosis. Our researches have proved that in a considerable proportion of cases of the human disease the lesions contain, and are caused by, bacilli which are in every respect indistinguishable from the bacilli which are the cause of tuberculosis in cattle. In all such cases the disease therefore is the same disease as bovine tuberculosis.

There remains the question whether avian tuberculosis and

bovine tuberculosis, or avian tuberculosis and the tuberculosis caused by the human type of bacillus, are one and the same disease. In this matter there does not appear to us to be in the present sufficient ground for answering the question in the affirmative.

Second Term of the Reference.

In the second term of our Reference we were asked :—Whether animals and man can be reciprocally infected with tuberculosis ; that is, whether the disease known as tuberculosis can be communicated direct from man to animals, and from animals to man ?

Taking the facts into consideration together with those others already discussed in relation to the first term of our reference, and excluding the fowl and other birds from further consideration in this connection, we must conclude that mammals and man can be reciprocally infected with the disease (tuberculosis). The possible danger to man through reciprocity in this sense was, of course, the more important question presented to us, and as we have conclusively shown that many cases of fatal tuberculosis in the human subject have been produced by the bacillus known to cause the disease in cattle, the possibility of such infection cannot be denied.

And the importance of this conclusion is not diminished by the fact that the majority of such cases examined by us occurred in young children, or by the merely local results following the administration of the human type of bacillus to bovine animals. Bovine animals are not completely immune to the human tubercle bacillus, and adult human beings can be infected with the bovine type, even the pulmonary form of the disease in man being sometimes caused by the bovine tubercle bacillus.

Third Term of the Reference.

The third question with which we are called upon to deal is :—

Under what conditions, if at all, the transmission of tuberculosis from animals to man takes place, and what are the circumstances favourable or unfavourable to such transmission ?

Transmission of tuberculosis from animals to man must obviously be mainly dependent on the susceptibility of any given animal to this disease and on the opportunities afforded such animal for transferring its acquired and developed infection to the human subject. From what we have already said, man must clearly be regarded as being liable to risk of infection from at least two of the three types of tubercle bacilli, the human and the bovine. In this connection it will be convenient to discuss each type separately.

Avian Tuberculosis.—Prima facie, man might be regarded as at some risk from this form of tuberculosis owing to his food relations with fowls and certain other birds, and the fact that we have in more than one instance discovered the avian tubercle bacillus in the bodies of pigs might also be considered a matter of importance. But in no single instance have we found the avian tubercle bacillus in the lesions of tuberculosis in the human being, whilst man's comparatively near relative, the monkey, would appear from our experiments

to be highly resistant to tubercle bacilli of this type. The pig is the only mammal in which we have found the avian bacillus in the lesions of naturally acquired tuberculosis, but possible danger to man from this source would appear to depend on an ability not yet demonstrated of this animal to bring about modification or alteration of this type of tubercle bacillus in the direction of greatly enhancing its virulence for man. We must conclude, as the result of our investigations, that the unmodified avian tubercle bacillus is a negligible factor in the production of human tuberculosis.

Human Tuberculosis.—In so far as tuberculosis of this type in animals lower than man has resulted from infection contributed to them by man himself, man has been multiplying in bodies other than his own that type of tubercle bacillus to which he is seemingly most prone, and thus increasing his chances of death by tuberculosis. But, as has been shown, animals, domestic and other, which have been found capable of suffering from severe generalized tuberculosis of the human type are comparatively few ; and further, none of these active multipliers of human tubercle are common food animals. The bovine animal, for instance, is not an active multiplier of the human tubercle bacillus, being highly refractory to this infection ; and the cow herself, however prone she may be when the subject of bovine tuberculosis to excrete bovine bacilli in her milk, has never under natural conditions been convicted of eliminating in this way the human tubercle bacillus. Experimentally, it is true, the human bacillus has been made to appear in the milk of the cow and goat, but for securing this end very large doses of culture have been requisite. Probably only when the cow or goat has received a large dose of tuberculous material derived from man does the human tubercle bacillus escape into the blood-stream of the animal, reach her milk sinuses, and become eliminated with her milk.

Nevertheless, it is not to be affirmed with confidence that man is wholly free from risk through animal food of infection with that type of tubercle bacillus to which he appears most prone, though the degree of danger to him in this sense must remain for the present undetermined. The pig, though not capable in our experimental experience of fostering tubercle bacilli of the human type except in a minor degree, may have to be regarded as a possible source of the disease caused in man by that type of bacillus ; for the reason that particular glands of the pig's body, which are likely to enter into certain prepared foods, do on occasion yield tubercle bacilli of the human type.

Bovine Tuberculosis.—Before dealing with the conditions affecting the direct transmission of tuberculosis from bovine animals to man, one other potential source of infection of man with the bovine type of the tubercle bacillus must be referred to. The pig is, besides the bovine, the only animal commonly used for food by man in which during our investigation we have found the bovine tubercle bacillus producing the progressive lesions of the natural disease. We found this bacillus in a number of cases of swine tuberculosis sufficient to justify us in calling attention to the danger without entering into a discussion as to its extent. Bovine tubercle bacilli are infective to human beings, and we have no reason to suppose that they can be rendered less so by previous residence in the bodies of pigs.

During the course of our inquiry we investigated material obtained either *post mortem* or by operation from 146 individual cases of persons suffering from tuberculosis; a total which does not include the two viruses consisting of sputum collected daily from a varying number of patients. But some of those 146 have been excluded from our final conclusions for reasons already set out on page 9, and certain others of them, though dealt with in detail in our Appendix, are not considered in this report, the investigations in which material from them was employed having but an indirect bearing on the terms of our reference. Thus the actual number of cases, representing the various clinical manifestations of tuberculosis commonly found in man, that have passed under strict observation and on which our conclusions are based, is 128.

So far as these 128 cases have been examples of tuberculosis in the adult, and especially when they have been cases of pulmonary tuberculosis, the lesions of the disease when fatal have been referable with few exceptions to human bacilli. Only rarely has a pulmonary lesion in adult man yielded the bovine bacillus. Our experience of abdominal tuberculosis in the human subject has been very different, especially as regards children. Of young children dying from primary abdominal tuberculosis, the fatal lesions could in nearly one-half of the cases be referred to the bovine bacillus, and to that type alone. In children, too, and often also in adolescents, suffering from cervical gland tuberculosis, a large proportion of the cases examined by us could be referred to the bovine tubercle bacillus. We have already in an earlier portion of this Report referred to the importance of infection by the bovine type of tubercle bacillus in cases of lupus occurring in adolescents and children.

Whatever, therefore, may be the animal source of tuberculosis in adolescents and in adult man, there can be no doubt that a considerable proportion of the tuberculosis affecting children is of bovine origin, more particularly that which affects primarily the abdominal organs and the cervical glands. And further, there can be no doubt that primary abdominal tuberculosis as well as tuberculosis of the cervical glands is commonly due to ingestion of tuberculous infective material.

Judging by our feeding experiments there would appear to be strong presumption that as regards most animals comparatively large doses given either singly or by frequent repetition are necessary to produce by ingestion acute progressive generalized tuberculosis, though we have recorded instances in which a very small dose administered but once has produced this result. Applying a like presumption to man (and our observations on the monkey and chimpanzee in this connection afford warrant for so doing) it may be asked in what way are children, the members of the human family who are especially liable to exhibit acute fatal tuberculosis commencing as an abdominal affection, most likely to obtain a large and fatally infective dose of tubercle bacilli?

As already indicated by us, to this question there can be but one answer:—namely that the evidence which we have accumulated goes to demonstrate that a considerable amount of the tuberculosis of childhood is to be ascribed to infection with bacilli of the bovine

type transmitted to children in meals consisting largely of the milk of the cow.

In many cases of abdominal tuberculosis and in tuberculosis of the cervical glands, however, it must be recollected that the child may be injured by the ingestion of bovine tubercle bacilli in milk without a fatal result occurring. The cases of abdominal tuberculosis examined by us had all been fatal, that is, death occurred from a generalized tuberculosis or from some local condition resulting, with possibly two exceptions, from tuberculosis of the abdomen. But many cases of abdominal tuberculosis in children recover, though what proportion of these is due to the bovine bacillus and what to the human, we have no means of knowing at present. The cases of cervical gland tuberculosis investigated by us were all cases that recovered or were recovering after operation, and a large proportion of them were bovine in origin.

Although the potency of tuberculous cow's milk in the causation of the tuberculosis of infancy and childhood is clearly demonstrated, in our examination of material from 55 cases of tuberculosis in adolescents and adults we have found rarely in the former and extremely seldom in the latter the bovine bacillus colonizing the fatal lesions.*

Instead we found abundantly in these lesions none but the human bacillus, a circumstance which, if considered alone, might tend to discount the extent of the danger to the adult human subject not only of the milk of tuberculous cows but also of the flesh of that and other animals capable of fostering the bovine tubercle bacillus. But it must be remembered that we have found cases of tuberculosis in adult man, sufficiently extensive to incapacitate the patient for the ordinary duties of life and in two instances ending fatally, in which we were able to attribute the disease solely to the effects of the bovine tubercle bacillus. Though of the 55 cases of adolescent and adult tuberculosis which came under scrutiny no more than 5 yielded bacilli of the bovine type, we cannot say that this figure adequately represents the proportion of like cases obtaining among the tuberculous population generally.*

Meanwhile we, in view of the evidence adduced by us, regard ourselves as called upon to pronounce on administrative measures required in the present for obtaining security against transmission of bovine tubercle bacilli by means of food. In the interests therefore of infants and children, the members of the population whom we have proved to be especially endangered, and for the reasonable safeguarding of the public health generally, we would urge that existing regulations and supervision of milk production and meat preparation be not relaxed; that on the contrary Government should cause to be enforced throughout the kingdom food regulations planned to afford better security against the infection of human beings through the medium of articles of diet derived from tuberculous animals.

* The 55 cases referred to include only those of tuberculosis other than lupus, cases of lupus coming under observation in adolescent and adult patients numbered 10, 3 of which yielded tubercle bacilli presenting the cultural characters of the bovine type though possessing less virulence for the calf and rabbit than the bovine tubercle bacillus.

More particularly we would urge action in this sense in order to avert or minimize the present danger arising from the consumption of infected milk. And in this connection it may be convenient for us to repeat certain facts observed by us in reference to the conditions tending to the elimination by the cow of bovine tubercle bacilli in her milk; facts in our opinion of such importance that they formed the subject of our Third Interim Report.

· Bovine tubercle bacilli are apt to be abundantly present in milk as sold to the public when there is tuberculous disease of the udder of the cow from which it was obtained. This fact is, we believe, generally recognized though not adequately guarded against. But these bacilli may also be present in the milk of tuberculous cows presenting no evidence whatever of disease of the udder, even when examined *post mortem*. Further, the milk of tuberculous cows not containing bacilli as it leaves the udder may, and frequently does, become infective by being contaminated with the fæces or uterine discharges of such diseased animals. We are convinced that measures for securing the prevention of ingestion of living bovine tubercle bacilli with milk would greatly reduce the number of cases of abdominal and cervical gland tuberculosis in children, and that such measures should include the exclusion from the food supply of the milk of the recognizably tuberculous cow, irrespective of the site of the disease, whether in the udder or in the internal organs.

EFFECT ON MILK OF WATER OR WATERY FOOD GIVEN TO COWS.

Alleged Indirect Adulteration of Milk.

The attention of the Board of Agriculture was called during the past year to notices in the Press as to the conviction of a dairyman in the French Courts for selling adulterated milk. This conviction was based on the assumption that it is possible to water milk either by feeding cows on watery food, or by causing them to drink water in large quantities, or immediately before being milked. The Board were not aware of any sufficient evidence to show that when the total supply of nourishment is sufficient it is possible to increase the quantity of the milk, at the expense of the quality, by these means; and as they considered that the dissemination of incorrect information on this subject among Officers of Local Authorities and others might lead to hardships to dairymen, they referred the matter to the Agricultural Education Association, and arranged with them to conduct experiments at the Midland Agricultural and Dairy College to test the points raised.

Seven typical dairy cows were selected from the College herd. They were of the dual-purpose Shorthorn type. These cattle were stall-fed during the whole of the time the experiment was in progress. Their food consisted of concentrated and dry fodders with the addition of mangolds, and at stated intervals, viz., every seventh day, it was supplemented with a definite amount of salt.

The amount of water taken daily was measured by allowing each cow to drink from a graduated vessel. During the first week access

to water was continuous, during the second intermittent. Milking was regularly and expeditiously undertaken, the interval between successive milkings being ten and fourteen hours, evening and morning respectively. The effect of the salt was to be determined by the variation in the yield of milk and its quality. The latter was done by sampling the milk from each cow at each milking, and analysing the milk for fat and solids during the same day.

The cows were numbered 1 to 7, and the scheme was mapped out in days. On the first day cow No. 1 received 4 oz. of salt, on the second day cow No. 2 was salted, and so on. Thus one day in each week a cow received salt, and on every day of that week some one cow was receiving salt. For the first seven days each cow had free access to a measured quantity of water. In the second week she was allowed to drink only just before being milked. In the third week water was free, on the fourth intermittent. From the experience gained in the first two weeks the experiment was altered so that instead of giving 4 oz. of salt in one meal, 3 oz. were given after the night's milking on one day and 3 oz. after the morning's milking on the next day. The feeding of 6 oz. of salt caused purging.

The result of the experiment appeared to show that periodical doses of common salt administered to cows even to the extent of purging them, do not necessarily cause them to consume excessive quantities of water; and that the amount of water consumed by cows has no direct bearing on the composition of their milk yield.

(*Journal of the Board of Agriculture*).

Miscellaneous.

ROYAL COLLEGE OF VETERINARY SURGEONS.

EXAMINATIONS IN LONDON.

At the meeting of the Board of Examiners held in London on July 14 for the Written, and on July 18, 19 and 20 for the Oral and Practical Examinations—

The following gentlemen passed their Final Examination :—

Mr. R. B. Cockburn	Mr. F. F. Horton
,, T. J. Davis	,, F. C. Minett
,, J. T. Edwards*	,, W. A. Pool
,, J. A. G. Gosling	,, S. C. Rowbotham
,, G. V. Golding	,, S. Smith
,, F. E. Heath	,, W. P. Stokes
,, H. E. Hornby	,, G. F. Steevenson*

The following gentlemen passed their Third Examination :—

Mr. V. Boyle	Mr. R. H. Knowles*
,, O. S. Broadhurst*	,, S. W. Marriott
,, K. J. S. Dowland	,, W. F. Morton
,, J. Facer	,, E. B. Reynolds*
,, E. S. Farbrother	,, J. M. Smith
,, J. Going	,, P. R. Viljoen
,, S. J. Gilbert*	,, U. W. F. Walker
,, W. P. Hamlyn*	,, R. T. Davis
,, A. C. Holl*	,, S. H. L. Woods
,, P. Howard	

The following passed their Second Examination :—

Mr. W. A. Austin
,, C. E. W. Bryan
,, D. Blyth*
,, C. Davenport
,, H. W. Dawes†
,, G. van de W. De Kock*
,, G. O. R. Grey*
,, A. Hoskin*
,, R. C. G. Hancock
Mr. W. B. Howe
,, V. J. Hare*
,, G. C. Harding
,, H. Hicks*
,, W. H. Priston
,, J. M. L. Penhale*
,, J. Southall
,, W. L. Sheffield
,, A. R. Smythe*

The following passed their First Examination :—

Mr. C. O. A. Anderton
,, A. Bayly
,, R. M. Bamford
,, H. H. Curson
,, H. S. Cockburn
,, H. Chown
,, R. W. D. C. Easom
,, E. E. Jelbart
,, A. G. E. Lalor
Mr. O. H. Melck
,, C. Rammell
,, H. C. Rockett
,, T. S. Roberts
,, P. S. Sparling
,, F. H. Stainton*
,, J. F. D. Tutt*
,, C. H. S. Townsend
,, W. H. Wortley†

Marked thus * passed with Second Class Honours.
Marked thus † passed with First Class Honours.

Examinations in Liverpool.

At the meeting of the Board of Examiners held at St. George's Hall on July 14 for the Written, and on July 19, 20 and 21 for the Practical Examinations, which were held at the University of Liverpool, the following gentlemen passed their Final Examination, and were admitted Members of the Royal College of Veterinary Surgeons :—

Mr. P. McGregor
,, F. J. Richmond
,, G. G. Howard
Mr. D. R. Hoddinott
,, S. K. Jones*
,, T. Craig

The following passed their Third Examination :—

Mr. W. Andrew
,, H. Sumner*
,, A. L. Pollard
Mr. J. W. Proctor
,, R. Isherwood*

The following passed their Second Examination :—

Mr. A. B. Gately
,, J. Blackburn*
,, C. W. Elan†
Mr. C. Wadsworth
,, R. Dawbney*
,, J. A. Ward*

The following passed their First Examination :—

Mr. R. P. Holmes†
,, G. Lloyd*
Mr. E. N. Kinsey

Marked thus * passed with Second Class Honours.
Marked thus † passed with First Class Honours.

Examinations in Dublin.

At the meeting of the Board of Examiners held in Dublin on July 14, 20, 21, 22, and 24, the following gentlemen passed their Final

Examination, and were admitted members of the Royal College of Veterinary Surgeons :—

Mr. P. J. MacCormack
,, M. Cunningham
,, H. J. Reidy
,, J. M. Crowe
,, P. F. Dolan
,, H. W. Carbury
Mr. T. M. Doyle
,, P. D. English
,, T. F. O'Brien
,, T. Le B. Revington
,, J. Smith
,, N. D. Vakil

The following passed their Third examination :—

Mr. M. Brett
,, M. P. Glynn*
,, J. J. Cosgrove*
,, H. E. Irwin
,, J. R. Jackson
Mr. T. McD. Kelly*
,, T. O'Leary
,, J. Quinlan*
,, F. B. Sneyd
,, R. C. Wheeler

The following passed their Second Examination :—

Mr. A. E. Brandon
,, E. S. M. Morgan
,, T. G. Browne*
,, T. D. Condell
,, J. R. Ellison
,, D. C. Green*
,, M. P. Hatch
,, J. J. Hegarty
Mr. J. P. McNally*
,, J. J. Mills
,, J. J. Pomeroy
,, A. D. Preston
,, T. Reddin
,, C. M. Stewart
,, M. Toomey

The Following passed their First Examination :—

Mr. I. C. Blake
,, J. O'Carroll
,, W. A. I. Buchanan
,, T. A. Connolly
,, F. Daly
,, G. J. Delaney
,, H. Dolan
,, R. Hans
,, C. P. Fisher*
,, P. J. Hayes
Mr. H. Jewell†
,, M. J. Killelea
,, W. E. Little
,, P. J. Mulcair
,, O. D. Neary*
,, T. F. O'Connor
,, W. P. Power*
,, M. J. Ryan
,, G. K. Shaw

Marked thus * passed with Second Class Honours.
Marked thus † passed with First Class Honours.

UNATTACHED LIST FOR THE TERRITORIAL FORCE.

(Extract from the London Gazette, dated Friday, July 7, 1911.)

Albert Edward Mettam to be Lieutenant, for service with the Royal Veterinary College of Ireland Contingent, Senior Division, Officers' Training Corps. Dated May 18, 1911.

James Joseph O'Connor to be Lieutenant, for service with the Royal Veterinary College of Ireland Contingent, Senior Division, Officers' Training Corps. Dated May 18, 1911.

James Ferguson Craig to be Lieutenant, for service with the Royal Veterinary College of Ireland Contingent, Senior Division, Officers' Training Corps. Dated May 18, 1911.

George Thomas Dunne to be Lieutenant, for service with the Royal Veterinary College of Ireland Contingent, Senior Division, Officers' Training Corps. Dated May 18, 1911.

Francis Bernard Hayes to be Lieutenant, for service with the Royal Veterinary College of Ireland Contingent, Senior Division, Officers' Training Corps. Dated May 18, 1911.

Translations.

A CASE OF STERCORAL CONCRETION.

MESSIEURS CAZALBOU AND SERISE.

Veterinary Surgeons to the 50th Regiment of Artillery.

THE mare Utile, 15 years old, was taken with colic on January 29. The symptoms were not very pronounced; the subject remained lying down, sometimes in lateral decubitus, and at other times right on her back. There was slight abdominal tympany. Examination of the infirmary record showed that she had not been ill previously. The mare had been employed at the construction works at Rennes, and took her meals a little later than her battery comrades, so that on her arrival the ration had been encroached upon by her neighbours, but this threw no light upon the nature of the affection. There were no aloine evacuations; rectal exploration showed emptiness of the terminal portions of the intestine and incomplete repletion of the accessible regions of the great colon. There was borborygmus in the cæcum and colon, and pressure of the abdomen caused slight pain. Castor oil was given, and intestinal irrigation with the long enema tube effected. On February 8, after ten days' treatment, there was abundant diarrhœa, and cure appeared to be obtained.

On February 11 the old symptoms reappeared, and persisted remittently until March 3. Constipation was always present, but after three injections, some small, hard, blackish, moulded dung balls were passed. On March 3 the illness assumed an alarming stage, and after three hours' agony the mare died.

Autopsy.—On opening the abdominal cavity there was a notable quantity of drinking water mixed with alimentary matter. The stomach, of small volume, was almost empty; the small intestine of reduced calibre presented zones of hæmorrhagic congestion, and its mucosa was covered with viscous liquid. The large colon was congested throughout and full of semi-liquid matter in its first half, more abundant and solid in its terminal portion—about 75 cm. beyond the origin of this organ was a tranverse rent involving the three tunics with hæmorrhagic borders, and 15 cm. long.

In the terminal part of the large colon obliterating the origin of the floating colon, and completely arresting the course of the intestinal contents, was a hard almost spherical mass incomplete at one of its polar caps, of a diameter of 20 cm., and of stone-like aspect; it was a stercoral concretion, weighing $1\frac{1}{3}$ kilogrammes.

Section showed a piece of coal in the centre surrounded by sand, and around this primitive foreign body a zone of impacted alimentary matter; a layer of sand and gravel surrounded this zone, and this in its turn was surrounded by a covering of felted alimentary material.

These two veterinary surgeons consider that the voidance of small dung balls of the kind here stated should constitute one of the symptoms of stercoral concretion, and that rectal irrigation should be insisted on. The position of this stone was, however, beyond the reach of the injections.

A few days after this case another mare, Férule, was attacked with colic whilst employed in the same work, and after treatment foreign matter was passed similar to that in the first case. To avoid recurrence of the complaint horses on the construction works have now been muzzled and their rations held back and only given to them on entering the stable.

(*Revue Générale de Médecine Vétérinaire.*)

ARTICULAR RHEUMATISM IN A DOG, FOLLOWED BY NECROSIS OF EXTREMITIES.

By Chief Veterinary-Surgeon FREISE.

Some time ago I was called to a five months old German sheep dog, well nourished and strong, which, according to the owner, had become suddenly stiff in the night and refused his food. The patient was lying completely prostrate and curled up in his basket. If called by his owner or offered milk he would not get up, but remained lying and whining with closed eyes. If one tried to straighten him out he curled up again, and when brought out he cried with pain.

The temperature was 40.9° C., the pulse 150, the breathing 45 per minute. The appetite was quite gone, and look anxious.

Closer examination showed that both fore-legs were greatly swollen at the carpus. The swellings were right round the joint and felt hot and tense. On the anterior surface of the right carpus slight fluctuation was discernible. As soon as slight pressure was put on the joint the animal shrieked with pain and tried to bite.

Examination of the heart and lungs showed nothing abnormal. The diagnosis was articular rheumatism.

Treatment.—Rubbing the joint with spirits of camphor and clothing the whole body in flannel. Internally, one of the following powders was given daily for three days:—

℞ Hydrargyrichlorat mit. 0.03 grm.
Sacchari 0.2 grm.
M. ft. pulv.

Against the loss of appetite:—

℞ Acidi hydrochlor } āā 5.0.
Pepsini ... ... }
Aqu. dest 300.0.
M. ft. solutio,

and further 0.3 of salol three times daily.

After seven days of this treatment the joint swellings declined and the patient moved about slowly in the room. The tempera-

ture declined to 39.7. But after three more days the condition got worse. The temperature rose to 41.7° C., the respirations to 52, and the pulse to 176 per minute. Patient kept to his basket, groaned and gnashed his teeth with pain. Closer examination showed that the right knee was greatly swollen, chiefly on its internal side, so that the dog could not use it. Treatment was continued and a warm bath at 30° C., with turpentine added, was given. After the bath the dog was dried and covered with flannel. Fresh milk and raw minced meat were given. After three and a half weeks he could move about fairly well, but limped on the fore feet and right hind foot. The weather being fine and hot, he lay down at the door basking in the sun. Cold wet weather coming on after this his condition got worse again. His gait was stiff and he lay in his basket and howled. The swellings round the joints became hot and painful; at some places the hair fell out, and at others there was a greasy, evil smelling secretion. The hairless places were greyish blue in colour, of leathery consistence, and completely non-sensitive to needle-pricks. Sloughing of the skin then occurred on both fore-legs, at the points of the tail and ears. The necrosis of the ears spread from the points to the middle of the aural muscles, and the distal half of the ears dried up. A piece 4 cm. long fell off the end of the tail. For some days it appeared as if the dog would die, but finally he was bathed in a one per cent. creolin solution and his lying place disinfected. He has now recovered, has a good appetite, and is lively.

(*Zeitschrift für Veterinärkunde.*)

Letters and Communications, &c.

G. Mayall; P. R. Thompson; Lieutenant Stewart; Secretary, Royal College of Veterinary Surgeons; Secretary, Royal (Dick) Veterinary College; L. M. Douglas; E. W. Bevan; Major Baldrey; Mr. A. W. N. Pillers.

Books and Periodicals, &c., Received.

Journal of Meat and Milk Hygiene; Journal of the Royal Army Medical Corps; Proceedings of the Royal Society of Medicine; Board of Agriculture and Fisheries; Department of Agriculture and Technical Instruction for Ireland; Tropical Agriculturist; Agricultural Journal for the Union of South Africa; Bureau of Animal Industry.

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THE

VETERINARY JOURNAL

SEPTEMBER, 1911.

Editorial.

VACCINATION FOR ANTHRAX.

THE subject of protective inoculation against anthrax bids fair to become of much greater importance to the practitioners and agriculturists of Great Britain than heretofore. It is an undeniable and unfortunate fact that outbreaks of anthrax in this country are increasing with considerable rapidity, and therefore any work on this question deserves to be closely followed so that any practical results can be adopted where applicable. It is with that end in view that we publish the article on this important subject in this issue of the VETERINARY JOURNAL, by Dr. Dawson, taken from a bulletin of the Bureau of Animal Industry. Space prevents us reproducing the whole of the bulletin, so we have taken up that portion referring to the production of immunity.

After going into detail concerning the Pasteurian method of immunizing against anthrax and satisfying himself as to the efficacy of that method, Dr. Dawson refers to the inconvenience entailed by two inoculations with the necessary interval, and the possible disastrous effects resulting from inoculating the second vaccine by mistake for the first. He reasonably concludes that it would be much better if a safe, reliable and effective single vaccine could be produced. Dr. Dawson claims to have accom-

plished this, and by his method the period required for the production of immunity is reduced by one-half, a matter of great importance in attempting to control any serious outbreak.

This method of vaccination, and also the double vaccine method, can be combined with the use of antianthrax serum, which, if used alone, produces an immediate passive immunity of only a very short duration, but just about long enough to enable the vaccine to produce the more durable active immunity.

That there are possible dangers such as are inseparable from any vaccination where pathogenic organisms are used must not be overlooked. If used indiscriminately new centres of infection might be established. Dr. Dawson has shown that anthrax bacilli may persist for at least eighteen days in the body of an immune animal. But what has not been shown, so far as we are aware, is the length of time bacilli may be present in an animal as the result of vaccination. Active immunity as the result of vaccination is undoubtedly due to recovery from a mild attack of the disease. During that mild attack it is conceivable that the vaccinated animal may be discharging infective material. That is a matter that requires solution. Another question that arises out of that is whether this mild attack may or may not be converted into a virulent attack by some such adverse complication as a reduced vitality of the patient or the development of a febrile condition from some other cause.

Until these points are elucidated therefore, it is doubtful whether anthrax vaccination can be definitely recommended in the present state of the disease in Great Britain. It is a different question, however, in those countries where the outbreaks are more severe and where considerable numbers of animals perish at each outbreak. In such cases there appears to be little doubt that the best method of procedure is to apply the combined method of inoculation of serum and vaccine as soon as the outbreak is discovered.

In this country, however, where the mortality at each outbreak of anthrax is very low, the use of antianthrax serum alone, as soon as anthrax has been diagnosed, would be sound economy. It would most probably ensure the safety of the remaining animals that had been infected by the fatal case or from the same original source, but in which the bacilli had not yet invaded the blood stream.

General Articles.

TOPOGRAPHY OF THE ABDOMINAL VISCERA OF THE DOG.

By O. CHARNOCK BRADLEY, M.D., D.Sc., M.R.C.V.S.
Principal of the Royal (Dick) Veterinary College, Edinburgh.

DOUBTLESS the operator, as the result of experience alone, in time becomes familiar with the position of organs though he may have had no assistance from a printed guide. In the case of the abdominal organs, valuable though ordinary dissection of the dead body may be, it is impossible to obtain an accurate knowledge of topography without extensive examination of specially prepared material. The mere opening of the abdomen and the inspection of its contents during an ordinary *post-mortem* examination is liable to lead to misconception of the position of the organs. This is more particularly the case if the thoracic cavity is opened as well. So long as the organs are flaccid, the removal of the support afforded by the abdominal wall results in displacement—sometimes more, sometimes less. If in addition the thorax is opened the resultant movement of the diaphragm exaggerates the displacement of the abdominal viscera. In order to obtain an accurate conception of abdominal topography it is, therefore, imperative that the viscera be fixed and hardened thoroughly before their inspection is undertaken. It is further necessary that the examination be conducted with care and accuracy.

So far as the topography of the abdominal viscera of the dog is concerned, the surgeon is practically limited for guidance to certain figures given by Ellenberger and Baum* and Sisson.† In these works, with the exception of two photographs reproduced in Sisson's recently published book, views of the organs are given from the side. Seeing that the bulk of operations are conducted with the animal lying on its back, these figures are in consequence of general value only.

In order to supply what was felt to be a want, a series of new observations has been made. A number of bodies of dogs of different breeds and of both sexes were thoroughly hardened

* Ellenberger und Baum. "Anatomie des Hundes," Berlin, 1891.
† Sisson. "A Text-book of Veterinary Anatomy," Philadelphia and London, 1910.

by the injection of a strong formol solution into the arteries while the animals were lying on the back. The wall of the abdomen and the organs in the cavity were then carefully dissected step by step and outline drawings made at different stages. In order that the exact relative positions might be recorded without possibility of error, the sketches were made through a wire screen. In the construction of the screen itself no precaution was omitted to ensure that it should contain perfect squares measuring 20 mm. each way. The outline drawings were made on paper ruled in squares corresponding in size with those of the screen, and all care was taken to make sure that the different dissections were viewed from a point immediately over the centre of the abdomen. The screen was adjusted each time so that one of the wires lay over the middle line of the body, and a cross wire lay immediately over the margin of the pubic bones at the symphysis. This method of investigation is not by any means new as it has been extensively used in human topographical anatomy.

The average positions of the various organs as determined in this way is indicated in the accompanying diagrams. Though these fail of their object if they are not self-explanatory, it may be well to draw attention to certain points and comment upon some of the variations which have been encountered. Fig. 1 is introduced to show the average extent of the fleshy part of the four abdominal muscles. In order to secure as much clearness as possible the external oblique (M.o.e.a.) and straight (M.r.a.) muscles are shown on the left side of the diagram, and the internal oblique (M.o.i.a.) and transverse (M.t.a.) muscles on the right side. On both sides the margins of the muscles are shown in dotted lines in order to indicate the extent to which one muscle overlaps another. The tendinous portions of the muscles are omitted.

It is interesting to notice that a narrow strip of the abdominal wall along the lateral margin of the straight muscle contains only the transverse muscle, whereas lateral to this there are two or three muscles depending upon the distance from the middle line. The external oblique does not at any point overlap the straight muscle, and the internal oblique does so only in the neighbourhood of the inguinal canal. In short, the superficial sheath of the straight muscle is entirely aponeurotic, while

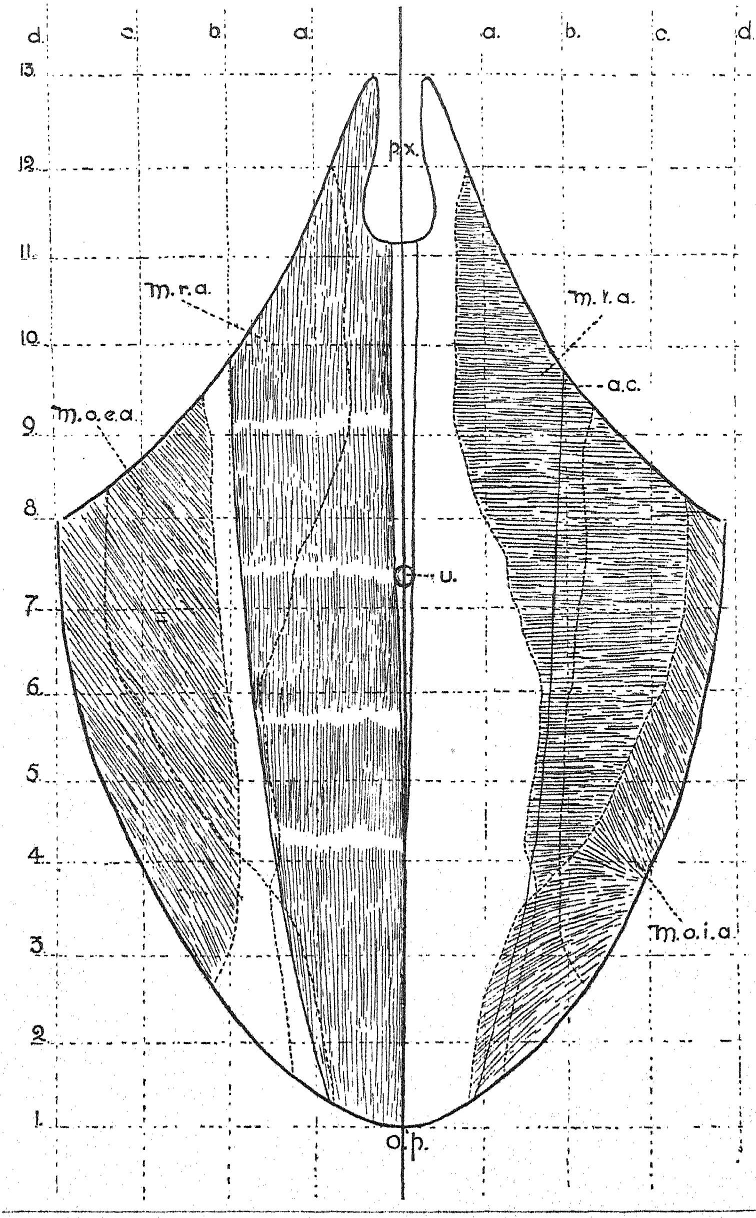

FIG. 1.

M.o.e.a., external oblique muscle; *M.r.a.*, straight muscle; *M.t.a.*, transverse muscle; *M.o.i.a.*, internal oblique muscle; *a.c.*, costal arch; *o.p.*, pubic bones; *p.x.*, xiphoid process of the sternum; *u.*, umbilicus.

its deep sheath is only partly muscular cranial to the umbilicus where the straight and transverse muscles overlap. It may be of moment to note that the straight muscle has one of its tendinous inscriptions on a level with the umbilicus and two caudal to this point. From its relationship to the underlying viscera, it should be added that in a thin animal it is not altogether difficult to determine the position of the lateral margin of the straight muscle during life. The last feature of the wall of the abdomen to which attention will be directed is the distance between the two straight muscles. In the region of the pubic bones the two muscles are close together; that is, the linea alba is exceedingly narrow. Towards the sternum a considerable interval separates the medial borders of the muscles.

The solid organ in which variability of position has the greatest range is the liver. Occasionally scarcely any of it appears beyond the costal arch. In other specimens it may reach to within a short distance of the umbilicus, and this without there being any pathological enlargement appreciable to the naked eye. The position as shown in the diagram (Fig. 2 h.) represents the average and may be taken as indicating the condition during inspiration. Naturally the position of the fundus of the gall-bladder fluctuates with that of the liver; but it may be said that in the majority of cases, when the abdominal wall has been removed, it is to be found in the space circumscribed by the xiphoid process of the sternum and the right costal arch (Fig. 2 v.f.).

Naturally the precise extent of the stomach depends upon the amount of ingesta contained therein. This being so inconstant it was not considered profitable to include the outline of the whole viscus in the diagram. The pylorus, however, being a comparatively fixed part is indicated as lying in the vicinity of the gall-bladder (Fig. 2 p.).

Because of its change of position dependent upon the amount of distention of the stomach, it is doubtful if anything very definite can be said of the topography of the spleen. Its dorsal extremity is certainly capable of precise location, since it is in contact with the left kidney (Fig. 2 l.); but the ventral part of the organ was found to be exceedingly variable. Sometimes it merely peeps out from underneath the costal arch; on the other hand it may extend for some distance towards the middle

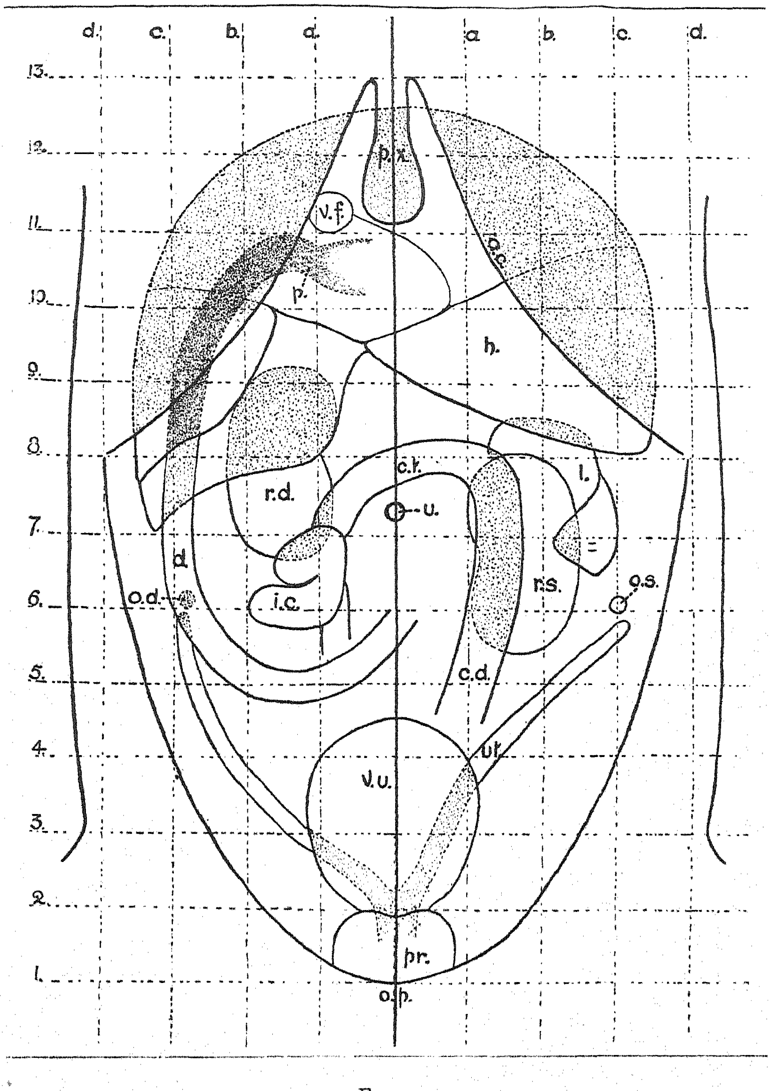

FIG. 2.

v.f., gall-bladder; *p.*, pylorus; *h.*, liver; *r.d.*, right kidney; *c.t.*, transverse colon; *l.*, spleen; *d.*, duodenum; *i.c.*, cæcum; *r.s.*, left kidney; *c.d.*, descending colon; *o.d.*, right ovary; *o.s.*, left ovary; *v.u.*, urinary bladder; *ut.*, uterus; *pr.*, prostate; *a.c.*, costal arch; *o.p.*, pubic bones; *p.x.*, xiphoid process of the sternum; *u.*, umbilicus.

line of the body. The position of the kidneys, on the contrary, may be indicated with considerable precision. Supposing the distance from the pubic bones to the angle of junction of the costal arch and the sternum be divided into thirteen equal parts as is done in the diagram, the middle of the length of the right kidney is at about 8/13ths of this distance (Fig. 2 r.d.); the left kidney being at nearly 7/13ths of the distance (Fig. 2 r.s.). Each kidney is roughly half-way between the median plane and the lateral wall of the abdomen; or, putting it in another way, the convex border of the kidney is approximately on a level with the lateral margin of the straight muscle of the abdomen.

The cæcum (Fig. 2 i.c.) is related to the caudal end of the right kidney and at no great distance from the middle line. Probably no part of the intestinal tube shows greater variability in its length and conformation. In the bulk of the specimens examined the cæcum was short and so bent as to form a comparatively compact mass; but in some cases the length was much greater, and in two instances (both young St. Bernards, 7½ months♂, 8 months♀) it was so long and capacious as to form one of the objects visible after removal of the abdominal wall and the great omentum.

It is doubtful if the position of the ascending and transverse colons as shown in the diagram is of much practical value; for though it shows the average for the specimens examined, it is an average about which there is a wide range of fluctuation. In some specimens it could hardly be said that an ascending colon existed, while in others it was of considerable length and even disposed in coils.

It was expected that the ovaries would be found as a rule fairly closely related to the kidneys. Such certainly was their position in some specimens, but that the average position was some little distance from the kidney is demonstrated by the diagram (Fig. 2 o.d. and o.s.). The broad ligament permits of considerable excursions of the uterus; consequently the diagram affords merely an approximation of its position.

The last point which needs mention relates to the prostate (Fig. 2 pr.). In every specimen examined practically the whole of this structure showed beyond the edge of the pubic bones. A very small portion of it might occasionally be described as having a real pelvic situation.

In the course of this short investigation, wherever an organ showed signs of pathological change it was rejected; and, if any viscus was so enlarged, distorted or shrunken as to make it possible that an effect might have been produced in the position of other viscera, the whole abdomen was put aside.

Possible objection may be raised that no distinction has been made between the male and the female abdomen. (The diagram is obviously hermaphrodite.) When the work was entered upon it was intended to compile two outlines—one for the male and one for the female. As the work proceeded, however, it became evident that this was unnecessary, since sex has apparently little or no influence upon the position of the majority of the organs. Beyond question the presence of a gravid uterus cannot fail to produce a disturbing influence of some degree; and, had it been possible to obtain a sufficient number of pregnant females, the result of pregnancy would have been shown in diagrammatic form. Paucity of suitable material, however, has prevented the inclusion of such a diagram in the present short communication. If time and material are available, it is intended to continue the observations in this direction.

SOME COMMON FORMS OF THE EQUINE PERFOLIATE TAPEWORM (*ANOPLOCEPHALA PERFOLIATA* GOEZE).

By A. W. NOEL PILLERS, F.R.C.V.S., F.Z.S.
Sheffield.

DURING the last two or three years, whilst examining the bowel contents of dead horses in this district, I have often come across animals infested with the above worm, and they appear to vary in their external characters to such a degree that one veterinary surgeon spoke of the different forms as representing different worms. *A. perfoliata* is distinguished from the other horse tapeworms by the presence of four rounded lobes which appear to arise from the hinder aspect of the head, two being on the ventral and two on the dorsal surface of the neck. There has, however, been some confusion with regard to the smaller forms of this species and *A. mamillana* Mehlis. Cobbold seemed to doubt the very existence of this latter species, and I have seen specimens labelled *A. mamillana* which turned

out to be small forms of *A. perfoliata* on careful examination. That such different forms exist is further shown by the fact that many helminthologists have thought it necessary to give these different forms specific names. When the equine perfoliate tapeworm was regarded as belonging to genus *Tænia*, Baillet described a *T. innome* and Megnin mentioned a *T. inerme*. Both of these were regarded by Cobbold as subspecies or varieties of *T. perfoliata*. Thus he spoke of them as *T. perfoliata* var. *Bailletii* and *T. perfoliata* var. *Megnini* respectively. The following remarks and sketches refer to some of the common forms met with. The chief variations are those of size, shape, colour and configuration of the head and neck.

The first form that should be mentioned is a small worm about 20 mm. long and 5 mm. broad. The head is small and set on the neck. The four cephalic lobes are only just visible,

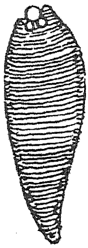

FIG. 1.

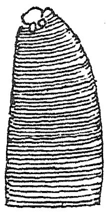

FIG. 2.

when carefully examined, at the junction of the head and neck. This form is often mistaken for *A. mamillana*. Although I have seen it in collections it does not appear to be common in this district.

A second type is represented in Fig. 1. The worm from which this sketch was made was taken with others from the cæcum of a horse destroyed on account of stifle lameness. He had been at grass for some months. The length of the worm was 34 mm., and its greatest width at the anterior third of the strobile was 12 mm. At the junction of the anterior and middle thirds the segments gradually became narrower until the posterior extremity ended in a point. The four cephalic lobes projected from the junction of the head and neck, but it was not possible to say to which they belonged. Another peculiar point was the "let in" and asymmetrical position of the head. The colour was yellowish with a tinge of green.

Fig. 2 was made from a specimen which, with many others of similar characters, was found in the same infestation as the above worm. The colour was the same. The head, however, was much more prominent, but still let in and inclined to one side. The length of the worm shown was 27 mm. with a width of 13 mm. at the widest point. The terminal segments were about 11 mm. wide. Probably the terminal sterile segments as seen in Fig. 1 had been shed.

From an aged mare grazing in Derbyshire I obtained a great number of specimens, all of which resembled Fig. 3. The colour of this form was distinctly white without the slightest trace of green or yellow. The average length was about 40 mm. and the width 12 mm. It will be seen that the cephalic extremity is quite distinct from the preceding forms, inasmuch as it is quite symmetrical in position and not let into the vegetative portion

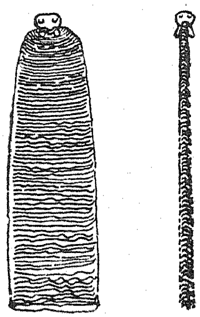

FIG. 3.

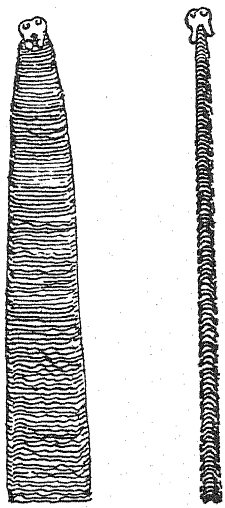

FIG. 4.

of the strobile. The widest portion of the worm was soon reached and remained about the same throughout the remainder of the segments. The cephalic lobes were rounded and well developed, and appeared to be separated from the head by a membrane, which was present on the dorsal and ventral surfaces, but not on the lateral aspects.

The last form appears to be found in imported pit ponies. Fig. 4 represents this type of tapeworm. The animal from

which it was taken was corn fed, and died of pneumonia whilst still in the mine. The colour of the worms was yellowish with a tinge of green. Their two most marked peculiarities, however, were their great lengths (50—70 mm.) and the marked development of the head. This was as wide as the neck and had become cube-shaped, with sides of about 3 mm. long. The cephalic lobes, instead of being represented by rounded masses, were seen to be backward projections from the hinder corners of the cube-shaped head. In some specimens these lobes attained a length of 2 mm. on one surface, whilst those of the other surface were always much shorter. The edges of the strobile as a whole appeared straight and slightly converging towards the head. I have heard this form spoken of as "the true horse tapeworm" by veterinary surgeons and knackermen.

It is not easy to offer an explanation to all of the above variations; and, moreover, it is not certain that they are of any great importance. However, having noticed them, I have recorded them for what the observations may be worth. Possibly Figs. 1, 2 and 4 are stages of growth, but Fig. 4 seems to stand out quite distinctly in regard to colour, shape and position of head, and its bilaterial symmetry. When compared with other tapeworms the specific differentiation of *A. perfoliata* from other members of the genus by means of the cephalic lobes seems very strong. One might even suggest that it were strong enough to be a generic value although it is an external character.

(The figures illustrating this article are drawn to natural size.)

ANTHRAX, WITH SPECIAL REFERENCE TO THE PRODUCTION OF IMMUNITY.*

By C. F. DAWSON, M.D., D.V.S.

Introduction.—Anthrax is primarily a disease of herbivorous animals, and occurs as an epizootic in sheep, cattle, horses, and mules, the animals being susceptible in the order named. In experimental work the small animals, such as mice, guinea pigs, and rabbits, are extremely susceptible. The French name for the disease is "charbon"; the German, "Milzbrand." When it occurs in domestic animals it is also sometimes known as splenic

* From Bulletin 137, Bureau of Animal Industry.

fever. In natural outbreaks anthrax usually has the character of a rapidly fatal septicæmia, with the presence of large numbers of the characteristic bacilli in the blood.

While the disease does not occur as a natural infection in man in the same sense as in animals, man frequently becomes infected from handling infected animals or their products, such as hides and hair. When man becomes infected through abrasions of the skin, the resulting disease process is carbunculous in nature and is known as "malignant pustule." When the infection takes place in the lungs, the disease is known under the name "woolsorters' disease." A third form in man may attack the intestinal tract. The latter two forms are rapidly fatal. In malignant pustule the disease may remain localized and the patient may recover. If, however, the bacilli migrate from the local lesion to the blood stream, death rapidly ensues, the patient dying from septicæmia or toxæmia.

Historical.—Anthrax is one of the oldest diseases. Moses records it in Exodus ix. 9. Homer, Ovid, Plutarch, Virgil, Pliny, and many others have mentioned it in their writings. It exists in all countries and in all latitudes. It was formerly very destructive to human life as well as to animals. In 1617, near Naples, 60,000 people are reported to have died from anthrax. In San Domingo, in 1770, 15,000 persons perished in the short period of six weeks. This enormous death-rate was probably due, in part, to eating the carcasses of animals dead from the disease.

It was not until the middle of the nineteenth century that scientists began the serious study of this very destructive disease. In 1849, Pollender, while studying the blood of animals dead from anthrax, discovered numerous rod-shaped, microscopic bodies, which he claimed were the cause of the disease. This claim remained unsubstantiated until 1863, when Davaine announced that the bodies discovered by Pollender were bacteria, and showed that the blood of an animal could not cause anthrax in another animal when injected into it unless it contained these bodies. To this bacterium Davaine gave the present name, *Bacillus anthracis*. Davaine's views were not immediately accepted, but others took up the work, and in 1876 Dr. Robert Koch, in making his first contribution to bacteriology, announced that he had been successful in proving the correctness of

Davaine's work on anthrax, and the question was then accepted as settled. Koch isolated the bacilli in pure culture and demonstrated their ability to form spores. He claimed that natural infection takes place through the intestinal tract, although he was at first unable to demonstrate this by feeding food infected by artificial cultures. Later, Pasteur succeeded in producing anthrax by feeding hay sprayed with cultures of *Bacillus anthracis* when he at the same time mixed with the hay thistles or any plants that would cause pricking or abrasions of the intestinal tract so that the bacilli could pass into the tissues.

Methods of Producing Immunity in Animals.

The Existing Method of Double Vaccination (Pasteur Method).

Since 1892 anthrax has been controlled by vaccination by a method devised by Louis Pasteur. This method consists in the subcutaneous injection of attenuated cultures of the bacillus of anthrax. Two injections of varying degrees of strength are made at an interval of 12 to 14 days. The first injection consists of 1 cubic centimetre of a culture that has been incubated at 42° to 43° C. for a sufficient time to decrease its virulence to a point where it will kill white mice, but not guinea pigs or rabbits. This generally requires a period of 24 days, assuming that the culture was made originally from a moist, virulent race of anthrax bacilli. Such cultures are to be made directly from the heart's blood of an animal that has died of anthrax within 48 hours after inoculation. In such blood we find only non-spore-bearing bacilli, and when these are grown at 42° to 43° C. they do not at any time produce spores while this temperature is maintained. Contrary to the statements of some, however, the bacilli promptly form spores when this temperature is reduced. These spores do not acquire any more virulence, however, than the parent bacilli which produced them.

The second injection consists of a culture similarly made and incubated at 42° to 43° C. for a period of 12 to 18 days, or one whose virulence has been reduced to a point where it will not kill rabbits but will kill white mice and guinea pigs, the latter in 3 or 4 days. The author's experience has shown that there is no hard and fast line in the number of days that a culture of a given race of anthrax bacilli must be attenuated. Much depends upon the resistance of the bacillus, the character of the culture

medium, the exactness of the temperature of the incubator, and the natural resistance of the animals used in testing the vaccines. When a culture of proper strength has been obtained and is properly transferred to fresh media about once a month and kept in a cool place where it will not evaporate, it may be used indefinitely as a stock culture for inoculating a liquid medium, which constitutes the vaccine. When such attenuated cultures are inoculated into animals, a very mild and clinically unnoticeable attack of anthrax is produced, which confers an active immunity which persists throughout the anthrax season. The inoculation must be repeated the following season.

Certain precautions are necessary in the application of anthrax vaccine. Assuming that the vaccine has been properly prepared, it is the duty of the veterinarian to ascertain that anthrax is not already existing in the animals he is about to vaccinate. As a precaution, when there is reason to suspect that anthrax may already be existing, no animal showing a fever should be vaccinated, as the disease may be carried from the already infected animal to others upon the point of the inoculating needle. Again, in order to prevent abscess in horses and mules by introducing under the skin streptococci or staphylococci by the point of the needle, the place of injection should be disinfected of these microbes. The anthrax bacillus cannot produce pus, but the germs usually found upon the skin are to be held responsible when abscess occurs from vaccination. The writer has been in the habit of dipping the point of the needle into strong carbolic acid contained in a small vial which may be conveniently carried in the side pocket at the time of vaccinating. None of this acid can enter the needle and kill the vaccine germs, as it is already filled with the vaccine, and none can be introduced under the skin, as it is all removed from the needle in its passage through the skin, and this in turn disinfects the wound made. While every veterinarian knows that hypodermic injections of medicine are daily made with a minimum of abscess production, it must be recognized that the conditions are not similar, and hence it is deemed highly advisable that these precautions be taken, especially in horses and mules.

There is usually little or no swelling at the point operated upon. Where abscess occurs the operator is to blame. It means that pus-producing germs have been carried in upon the needle

and that either the needle or the skin was not disinfected. Abscess is more likely to occur in horses and mules than in other animals.

It has been the practice in Delaware to continue the vaccinated animals at their usual work. We have no data upon the subject showing this is unwise, but it is believed that the animals should be shielded as much as possible from excessive work and from extremes of heat or cold or from chilling rains. We advise our vaccinators, who consist of regular, practising veterinarians designated by the Governor upon the recommendation of the Board of Agriculture, to destroy all opened bottles of vaccine that remain unused at the end of a day's work, as it will certainly become contaminated and be spoiled if kept overnight at ordinary temperatures. The vaccine is dispensed in 50-dose bottles hermetically sealed and distinctively labelled, so there can be no mistake made in using it.

Effectiveness of the Method.

The results of vaccination have been as good, as shown by our statistics, as those obtained by the use of any other biological product. That the method is entirely safe is shown by the fact that only one dangerous swelling has been brought to our notice in three years' experience in Delaware. Every year there are instances where, for some reason, animals that have been vaccinated die from anthrax, showing that they were not protected by the vaccine. No doubt some of these failures may be due to the animal being missed during vaccinating. In other cases the failure may be due to the vaccine needle not properly puncturing the skin, so that the vaccine falls upon the ground. These accidents are readily brought about when the animals are unruly. On the other hand, the writer has observed a case of anthrax that occurred in vaccinated animals—that is, where it was positively certain that the vaccine was properly prepared and active and had been properly applied.

Some cases of non-protection by vaccination can be explained by the fact that the vaccine itself was inert, and therefore non-protective. Cultures made from such vaccine failed to grow. The vaccine would, of course, fail in the usual physiological test for an anthrax vaccine, and, of course, would fail to protect the animal against anthrax. The writer has known of instances where for various reasons an animal would escape vaccination,

and that animal would be the only one to die on that farm. Hence he feels warranted in highly commending vaccination as the most important means of combating this terrible scourge. In France, where vaccination is most popular, and where statistics are reliable because of Governmental control, the death-rate before vaccination was adopted was, in cattle 5 per cent., and in sheep 10 per cent. After vaccination was adopted the losses were reduced to 0.34 per cent. in cattle and 0.94 per cent. in sheep. In Delaware the losses in 1907 in horses and cattle that were vaccinated were 0.32 per cent.

Vaccination should be practised every spring, at least a month before it is time to turn the animals out to pasture, as a month is required for the production of immunity. This vaccinating should not be optional with the owner, as at present, but should be compulsory, the State assuming the risk of loss from the use of vaccine, but not in those cases where it can be shown the animal died not from vaccination but from a natural infection, owing to failure of being protected by the vaccine, or from other causes.

A Test of Pasteur Vaccines.

Along with the investigation of anthrax for the purpose of discovering new methods of treatment and prevention of the disease, and for studying the biology of the causative organism and the general sanitary aspects of the subject, it was decided to test the efficacy of freshly prepared Pasteur vaccines. It is believed that some of the bad results that have been reported as following the use of Pasteur vaccine is due to carelessness on the part of those preparing and using it. As there is no visible difference in the appearance of the two vaccines, Nos. 1 and 2, it is an easy matter to get the bottles mixed or improperly labelled. If the labels should come off the bottles, the vaccinator would have no guide as to which vaccine he was using. The writer has purchased anthrax vaccines on the open market, and has found some that were wholly inert and others that were too strong when tested in the usual way.

For the purpose of gaining such information as is possible from the practical experiences of practising veterinarians who vaccinate against anthrax in Delaware, the writer undertook to prepare Pasteur vaccines for the State Board of Agriculture, which were to be used as soon as possible after they had reached

destination. The cultures constituting the vaccines were grown in 50-dose bottles, each bottle containing 50 c.c. of bouillon which had been inoculated 24 hours previously with the vaccinal germs. The official vaccinator was furnished first with No. 1 vaccine. In 12 days he was shipped the No. 2 vaccine, for use on the same animals. Under this plan it was impossible for the bottles of vaccine to get mixed, even though the labels came off.

The plan of using fresh vaccine in which the germ is still in the bacillar stage was continued with good results for two seasons. For the last two years the plan of using vaccines that had been incubated for four or five days, or until the bacilli had spored, has been tried. This latter method represents the condition of vaccine as put on the market by commercial houses, and is a suspension of spores instead of bacilli. According to the experiences of these two seasons, we have reason to believe that the vaccine will remain active for several months, and such cultures may be prepared several months in advance of their use, provided the incubation is carried to a point where all growth ceases, or spores form. These spores inherit just that degree of strength possessed by their progenitors, and do not change except with a considerable lapse of time, possibly a year, if kept under favourable conditions. It is highly important that anaerobic conditions be not established in the bottles, as the bacilli will sink to the bottom and will not spore when grown anaerobically. To prevent this, it is important that the culture medium be made to reabsorb the air which has been driven out of it during sterilization before being inoculated with the vaccine germs. In preserving stock cultures of the vaccine it is very important that they be incubated for several days before being taken out of the incubator. If they are removed before spores have formed, the more vulnerable bacilli may succumb to existing unfavourable conditions. To these conditions may be ascribed the death of cultures of anthrax vaccine, and the loss of virulence of former virulent cultures of anthrax bacilli, which sometimes occur during the course of laboratory work.

Experiments with Various Substances to Test Immunizing Powers.

Experiments upon the disease have been carried on uninterruptedly for the past three years. These had for their object the preparation of substances in the laboratory and in living animals

which could be used in combating anthrax by acting as antitoxins or bactericides, or as vaccines.

Realizing the great importance and economy in producing protective and curative substances in the laboratory over the necessarily expensive methods when employing animals for the same purposes, efforts have been made along the line of producing various culture products to be used in combating anthrax.

Pyocyanase, made after the method of Emmerich and Loew, gave some good results when tested upon rabbits, but failed upon sheep.

Anthraxase, prepared by the writer after the same general method used in producing pyocyanase, was without protective or curative properties, although it produced high fever when injected into rabbits and sheep subcutaneously.

Anthraxoin, consisting of a turbid suspension of dead anthrax bacilli, was apparently useless in protecting sheep against anthrax when used similarly to the Pasteur vaccine.

A single vaccine, having for its object the production of immunity in two weeks, and thus cutting down the necessary period by one half, was made by incubating a virulent bacillus for about 18 days at 42° to 43° C. Such a culture will kill guinea pigs in about a week, and in strength it thus holds a position between the two vaccines of Pasteur. With it sheep were vaccinated, and after 12 days withstood an otherwise fatal infection with virulent bacilli. In some cases, however, the immunity was not sufficiently strong, as was evidenced by the death, now and then, of a sheep when tested with virulent bacilli.

The preparation and use of the various substances, together with the results of the experimental work, are described in the following pages.

Anthraxin.

Anthraxin was made similarly to tuberculin and mallein. The cultures of anthrax were grown for 10 days with daily shaking in glycerinated, peptonized bouillon, the glycerin being used in 4 per cent. strength. The cultures were then sterilized by boiling, filtered through Berkefeld filters, and then evaporated to one-tenth of the original volume. A sirupy liquid, much resembling tuberculin, resulted. It was tested on rabbits and sheep for immunizing properties.

From the experiments we gather that anthraxin was possessed of no immunizing properties whatever.

Pyocyanase.

Pyocyanase, the next substance experimented with, was prepared as follows: Large flasks of medium were inoculated with *Bacillus pyocyaneus* and grown at 37° C. until a ropy condition was produced, which required three weeks, the flasks meanwhile being shaken daily. The composition of the medium was as follows: Peptone, 0.5 per cent.; glycerine, 0.1 per cent.; dipotassium phosphate, 0.1 per cent.; magnesium sulphate, 0.01 per cent.; sodium chloride, 0.3 per cent.; sodium bicarbonate, 0.1 per cent.; in distilled water (synthetic medium of Emmerich and Loew). When growth had ceased in this medium the growths from a number of agar-agar cultures of the same organism were added, and the whole was thoroughly shaken. The culture medium was then neutralized with dilute hydrochloric acid. Carbolic acid was then added to 0.2 per cent. strength as a preservative. The liquid was then evaporated down to one-tenth of its original volume at ordinary room temperature by being placed in pie plates. Then the liquid was dialyzed for 24 hours in running water, filtered through Berkefeld filters, and 0.2 per cent. carbolic acid was again added to replace that which was dialyzed out. The resulting liquid, pyocyanase, has a dark coffee colour and a pungent odour. The experiments to test its immunizing and curative properties were performed upon guinea pigs, rabbits, and sheep.

One series of experiments was made with unfiltered pyocyanase. The dead bacilli produce abscesses at points of injection and frequently disease of the liver, which contributed to death from anthrax.

By a series of experiments with filtered pyocyanase it was proved that when given in proper dose and simultaneously with virulent anthrax bacilli, the period of inoculation is greatly lengthened in rabbits. Sheep, however, seem to be very susceptible to poisoning by pyocyanase, and no immunity is conferred upon them by its use.

Anthraxase.

Anthraxase was made in about the same manner as pyocyanase, except that the *Bacillus anthracis* was substituted for *Bacillus pyocyaneus*. The tests of this substance include cultures

grown in ordinary bouillon, cultures grown in Emmerich and Loew's medium, and experiments with precipitated anthraxase. In each case it was found to be practically useless.

Anthraxoin.

Anthraxoin was prepared and experimented with as follows: It consists essentially of a suspension, in carbolized normal salt solution, of dead, sporeless, anthrax bacilli. It was produced by inoculating, from a fresh anthrax carcase, bottles that had been filled completely with nutrient bouillon and plugged with hardest paraffin stoppers. In this way none but sporeless bacilli were introduced, and under the existing anaerobic conditions no spores could form. After all growth had ceased, at 35° C., these cultures were completely immersed in a water bath maintained at 55° C. for one hour, which was sufficient to devitalize the bacilli but not to destroy any antibodies they might contain. The dead bacilli were separated by filtration from the liquid in which they had grown, and those adhering to the Berkefeld filter were washed off in the requisite amount of carbolized normal salt solution. The suspension experimented with consisted of the bacilli that grew in 2,500 c.c. of bouillon, suspended in 50 c.c. of carbolized normal sodium chloride solution. It was found as the result of the experiments to be practically useless.

A Commercial Vaccine in Pill Form.

A commercial vaccine which, according to the makers, consists of dead anthrax organisms in pill form was also tested. These small pills are placed under the skin by means of a trocar and are claimed by the makers to produce immunity to anthrax. Microscopic examination, as well as cultural and animal experiments, show that the claims of the makers, in so far as the vaccine being dead and harmless is concerned, are true. One can easily see with the microscope that these little pills consist of dead anthrax bacilli and their spores held together in pill form by a proper excipient. The writer was unable, however, to verify the claim that they produce any immunity. A rabbit succumbed in six days, but as it is very rarely that a rabbit can be immunized by a vaccine, a sheep, which animal is easily protected, was also employed, with negative results.

PREPARATION OF AN EFFECTIVE SINGLE VACCINE.

The single vaccine, like Pasteur vaccine, consists of cultures of attenuated anthrax bacilli, the only difference being in the degree of attenuation and that, as its name implies, it is applied only once, thus requiring a shorter time and only one handling of the animals.

To prepare such a vaccine or attenuated culture, the virulence of an already virulent culture of anthrax was exalted by passage through very young animals. A strain can in this way be produced which will kill a sucking rabbit in twenty-four hours. From the heart's blood of such a carcase tubes of bouillon are inoculated immediately after death. These cultures are then incubated at 42° to 43° C. for varying periods of time—from twelve to eighteen days. On the twelfth day a subculture is made from one of the tubes and cultivated at 35° C. On the thirteenth and succeeding days subcultures are made from the remaining tubes until the series has been completed. These six subcultures of attenuated bacilli are now tested on guinea pigs and rabbits, and on sheep if possible.

More dependence is to be placed upon the animal test than upon the number of days the attenuation process is carried on. A culture of proper strength is generally obtained from tubes that have been attenuated for about 16 days. The proper culture will be one which will not kill rabbits, but which will kill a majority of guinea-pigs in a delayed period, say 5 or six days. Such an animal should show no swelling at the point of inoculation, and the bacilli should be found only sparingly in the internal organs. When shaken in cultures such a vaccine shows a homogeneous clouding of the medium; no flocculi persisting, as occurs in virulent cultures.

As rabbits and guinea-pigs cannot be made immune to anthrax by vaccination of this kind, these animals are only useful in testing the pathogenesis of the cultures. For testing the immunizing property, sheep, which are easily immunized, were employed. Quite a number of sheep were used in the experiment to produce a safe, efficient single vaccine, and as regards the failures along this line, it is only necessary to say that they were entirely due to improper attenuation of the cultures. When the proper attenuation was reached there was no difficulty in immunizing animals by a single vaccination. This was effective

against a subsequent, otherwise mortal dose of virulent anthrax bacilli, as the following experiments will show.

Tests of the Single Vaccine.

Experiment No. 1.—On April 15, 1909, a visibly pregnant cow was given subcutaneously 1 c.c. of single vaccine. She showed no ill effects whatever from the injection. On May 1 the animal was inoculated with 0.2 c.c. of virulent anthrax bacilli from a 24-hour culture which killed a check rabbit and a check cow in 48 hours. On May 19 the cow dropped a fully developed calf which when found was dead, lying with its head bent under the shoulder. Supposing that the calf had been asphyxiated, it and the membranes were buried. However, a platinum loop full of the discharge was plated and a pure culture of 60,000 anthrax bacilli was obtained. A guinea-pig inoculated with a culture made from one of these colonies died of anthrax in 48 hours. The cow remained well, and subsequent daily cultivations from vaginal discharges showed no anthrax bacilli.

This experiment was extremely valuable, not only as showing that the cow had been immunized by a single vaccination, but also for showing not only that anthrax can be communicated to the fœtus, but that it can be thus communicated by an immune mother. It also showed that anthrax bacilli may persist for at least 18 days in the body of an immune animal. When the cow was destroyed for various reasons on May 25 she was in perfect health, and cultures and inoculations made with her blood showed no anthrax bacilli present. It is to be regretted that this animal could not have been kept for further observations and experiments.

Experiment No. 2.—On September 14, 1909, two sheep were vaccinated with single vaccine, each receiving 1 c.c., and showed no sickness therefrom. On September 28 each sheep was inoculated subcutaneously with 0.2 c.c. of a culture of anthrax bacilli whose virulence had been proved on a rabbit in the same experiment. The sheep at no time showed any sickness. On November 2 both sheep were again tested with virulent bacilli and showed no sickness.

Experiment No. 3.—On November 12, 1909, three sheep were vaccinated with 1 c.c. of single vaccine and showed no sickness therefrom. On November 27 one of the animals was tested

with 0.2 c.c. of virulent bacilli, and on December 1 the other two were similarly tested. They at no time showed any sickness. These three sheep, together with the two used in experiment No. 2, were used later in experiments to produce an antibacterial serum.

A Serum for Producing Immediate Immunity.

Although the favourable results from vaccination by the Pasteur system have been known for a long time, and owing to the cheapness of the vaccine it would seem that there is nothing more to be desired, the length of time required to produce immunity is one drawback in its use when one is endeavouring to check an existing outbreak of the disease. When vaccination is practised a month in advance of the animals being turned out to pasture in the spring, the system of Pasteur vaccination is the proper one to use. In existing outbreaks, however, it is evident that any system that requires a month to become protective leaves much to be desired, as many animals could become infected and die before protection could be afforded them.

With the end in view of devising a method whereby an immediate immunity could be established in existing outbreaks or where an immunity could be brought about in a much shorter time than has been possible under the old system of vaccination, the writer has devoted a large portion of his time for the past three years. As it had been conclusively demonstrated that animals can be immunized by a single vaccine, thus cutting down one-half the period necessary for immunization by the old system of Pasteur, it was decided to experiment upon the production of an antianthrax serum by endeavouring to hyperimmunize sheep after the manner of the production of anti-hog-cholera serum, with the exception that whereas in the latter work virulent blood was used, this was precluded in our experiments owing to the dangers attending the handling of large quantities of virulent anthrax blood. Instead, the blood used was that drawn from an animal immune to anthrax, and not from one sick with anthrax.

Briefly stated, the writer has produced an antibacterial serum by highly immunizing sheep through repeated inoculations, first of attenuated anthrax bacilli, and following these by inoculations

of the most virulent races of the bacilli in increasing doses until the animal would withstand with impunity fifty thousand times the minimal lethal dose. Such a serum will protect a sheep against an otherwise mortal dose of bacilli and produce an immediate immunity. It is, therefore, a very valuable adjunct in working against the spread of the disease in existing outbreaks where the usual vaccination is becoming practised. The serum will confer a passive immunity immediately, and thus protect the animal against fatal infection until the vaccine confers an active immunity. And should an animal which has been protected by the serum become infected with a virulent anthrax bacillus, the results of this infection will be the production of a much stronger immunity than the vaccine and serum would otherwise confer.

It is evident that if a single vaccine, or even a double vaccine, can be used in conjunction with an antibacterial serum to produce immediate passive immunity which will persist until the vaccine has had time to bring about active immunity, a long step will have been made in controlling this formidable disease. The experiments with this end in view were carried out upon sheep as follows:—

Experiments with the Serum.

Experiment No. 1.—On December 15, 1909, a sheep immunized with single vaccine and a subsequent inoculation with virulent bacilli (see Experiments Nos. 2 and 3 with single vaccine) was bled from the carotid artery—the femoral artery being small and deep-seated—by means of a glass cannula and rubber tubing. When the blood had clotted, 500 c.c. of serum were decanted and injected into the inguinal regions of another sheep which had been similarly immunized. Microscopic examinations and inoculations into guinea pigs of this blood showed it to be free of anthrax bacilli. The injected sheep was lame in both hind legs the next day, but this lameness disappeared when the complete absorption of the injected blood had taken place, and no abscess formed. On January 12 this sheep was bled from the carotid artery, and when the serum was collected it was preserved by adding to it one part of a 5 per cent. solution of carbolic acid to each nine parts of serum. In making this addition of carbolic acid some coagulation will occur if the

preservative and serum be not poured simultaneously into another vessel and stirred by a helper.

The above serum was without protective properties. All animals upon which it was used died of anthrax, as follows:—

On January 13, 1910, 12 guinea pigs received increasing doses of serum from 0.1 up to 3 c.c. and simultaneously 0.1 c.c. of virulent anthrax culture. All of these animals died of anthrax in forty-eight hours.

On January 17, 1910, the amounts of serum were increased to 4 c.c., 5 c.c., 6 c.c., 7 c.c., 8 c.c., 9 c.c., and 10 c.c., with a simultaneous dose of 0.1 c.c. of virulent culture. The 7 animals thus tested also died in forty-eight hours.

On February 5, 1910, a sheep received simultaneously 24 c.c.. of the serum and 0.2 c.c. of virulent culture. A control rabbit died in forty-eight hours and the sheep died of anthrax in three days.

On February 9, 10, and 11 another sheep received daily 12 c.c. of the serum and on the 12th a test dose of virulent bacilli. This sheep lived four days and then died of anthrax.

These experiments demonstrated that the modified hog-cholera method of serum production could not be applied to anthrax, and it was then decided to try and bring about hyperimmunization by increasing doses of virulent bacilli repeated over a long period. The two sheep used in Experiment No. 2 with single vaccine were employed for this purpose as follows:—

Experiment No. 2.—On September 14, 1909, two sheep were vaccinated with 1 c.c. of single vaccine. On September 28 they were given a test dose of 0.2 c.c. of virulent bacilli, and remained well, while a check rabbit died in forty-eight hours. On November 2 each sheep again received 0.2 c.c. of virulent bacilli. On March 4, 1910, each sheep received 0.3 c.c. of virulent bacilli. On March 18 they received 1 c.c. of virulent bacilli, and on April 2 each sheep received 5 c.c. of virulent bacilli. A period of about seven months was thus consumed.

On April 14, 1910, these sheep were bled from the carotid artery, producing 1,900 c.c. of serum, to which was added one part of a 5 per cent. solution of carbolic acid to each nine parts of serum as a preservative. Prior to the addition of the preservative tests for the presence of anthrax bacilli were made upon guinea pigs and by plate cultures. None were found.

This serum was used upon sheep in connection with virulent anthrax bacilli as shown in the following table:—

TABLE.—EXPERIMENTS WITH ANTIANTHRAX SERUM.

Animal	Date	Injections		Results and remarks
		Immune serum	Virulent culture	
Sheep 17...	Apr. 29	5 c.c. subcutaneous	0.2 c.c. subcutaneous ...	—
	May 16	... ...	.2 ,, ,, ...	Sheep remains well.
Rabbit (control)	,,	... ...	.1 ,, ,, ...	Rabbit dies in 48 hours.
Sheep 18...	May 21	10 c.c. subcutaneous	.1 ,, ,, ...	Not sick.
	June 20	,, ,,	.2 ,, ,, ...	No bad result.
	July 6	,, ,,	.5 ,, ,, ...	Remained well.
Rabbit (control)	May 21	... ...	.1 ,, virulent culture...	Died in 48 hours.
Sheep 19...	May 24	10 c.c. subcutaneous	.1 ,, subcutaneous ...	—
	June 20	,, ,,	.1 ,, ,, ...	Remained well.
	July 6	,, ,,	.5 ,, ,, ...	—
Rabbit (control)	May 24	... ...	.1 ,, virulent culture...	Died in 48 hours.
Sheep 20...	May 27	... ...	.5 ,, single vaccine ...	—
	June 20	10 c.c. subcutaneous	.1 ,, virulent culture...	—
	July 6	,, ,,	.5 ,, ,, ...	Remained well.
Sheep 21...	May 27	... ...	.5 ,, single vaccine ...	—
	June 20	10 c.c. subcutaneous	.1 ,, virulent culture...	Remained well.
	July 6	,, ,,	.5 ,, ,, ...	—
Rabbit (control)	June 20	... ...	.1 ,, ,, ...	Dead in 48 hours.
Sheep 22...	June 1	5 c.c. subcutaneous	1.0 ,, single vaccine ...	—
	,, 18	10 ,, ,,	.1 ,, virulent culture...	Remained well.
	July 6	10 ,, ,,	.5 ,, ,, ...	—
Sheep 23...	June 1	5 c.c. subcutaneous	1.0 ,, single vaccine ...	—
	,, 18	10 ,, ,,	.5 ,, virulent culture...	Remained well.
	July 6	10 ,, ,,	.5 ,, ,, ...	—
Sheep 24...	June 1	5 c.c. subcutaneous	1.0 ,, single vaccine ...	—
	,, 18	10 ,, ,,	.1 ,, virulent culture...	Remained well.
	July 6	10 ,, ,,	.5 ,, ,, ...	—
Sheep 25 (control)	June 18	... ...	.1 ,, ,, ...	Died of anthrax in 48 hours (control for sheep 22, 23, and 24, for inoculations June 18).
Rabbit (control)	July 6	... ...	.1 ,, ,, ...	Died of anthrax in 48 hours (control for sheep 22, 23, and 24, for inoculations on July 6).

No doubt the period of time occupied in hyperimmunizing the sheep which produced this highly protective serum can be very much lessened—probably one-half. It will be noted that the time covered was about seven months. This was not intentional, but as the sheep had already been immunized for another object, and not used, it was decided to carry out the idea of

greatly increasing their immunity by the method followed. It will be seen by referring to the table that an idle period of about three months elapsed between November, 1909, and February, 1910, which might just as well have been employed for this purpose. It is also possible that by giving larger doses of virulent bacilli the immunizing property of the serum may be considerably increased.

That the degree of immunity can be established by the number of inoculations and the quantity of virulent culture used was clearly shown in sheep Nos. 18, 19, 20, 21, 22, 23, and 24. They had received three injections of serum and three inoculations with bacilli, in very small doses, and while they themselves were immune (see table) their blood, when tested after slaughter on July 18, did not protect other sheep.

It is also highly probable that sheep will produce a more effective antianthrax serum for their own species, and cattle for cattle, horses for horses, &c.; that is, the sera should be homologous. However, no effort was made to test this principle, as the great expense attending such experiments precluded their being carried out.

Conclusion.

The writer does not advise the abandonment of the old Pasteur system of vaccination against anthrax when it is practised upon animals before they are turned out on the pastures in the spring of the year. When animals are dying, however, vaccination alone requires too long a period to protect, and it is in these outbreaks that the antianthrax serum should be used in conjunction with vaccine. The experiments have shown that a single vaccine may be used with good results. Where it is desired, however, the serum may be used simultaneously with the double vaccine or with a single vaccine.

PYÆMIC HEPATITIS AFFECTING SHEEP.

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An epidemic of this disease which, so far as I am aware, has hitherto been undescribed in sheep was brought under notice by Mr. W. A. Kendall, G.M.V.C. The cases occurred in a valuable stud flock of merinos. The disease was confined to sheep grazing in two paddocks and appeared only in those which had been bought in another State. A number of sheep succumbed, and according to the owner all were similarly affected. The animals were all in fair condition, and no definite symptoms appear to have been manifested before death.

According to the owner's account to Mr. Kendall the only internal organ which showed distinct evidence of disease was the liver, and it was this organ, from one of the last cases to occur, which had been brought for Mr. Kendall's opinion, that I had an opportunity of examining.

To the naked eye the organ was enlarged, dark in colour, congested, and thickly studded throughout, but especially under the capsule with spherical, greyish-yellow nodules, varying in size from a pin-head and even smaller, to that of a split-pea. These areas were so numerous that the surface of the liver on section in any plane showed from 3 to 6 per sq. in. visible to the naked eye. Each nodule was composed of homogeneous material, dense in consistency and firmly adherent to the liver substance.

Microscopical examination of smears showed that these "tubercles" were composed of degenerating pus cells, with masses of bipolar staining, Gram-negative, short double bacilli.

The hepatic lymphatic glands were enlarged, congested, and thickly studded with similar tubercles to those observed throughout the liver.

Microscopical Examination of Hepatic Lesions.—Sections of liver show the organ to be affected with early biliary cirrhosis (probably due to a previous attack of distomatosis, a common affection of Victorian sheep). There is congestion of the portal capillaries, and scattered thickly throughout the parenchyma are minute spherical areas composed of white blood corpuscles, chiefly polymorphs, the centre of each consisting of granular débris amongst which are masses of the cocco-bacilli described.

The "tubercles" of the hepatic lymph glands show histologically the same structure.

The Pathogenic Organism.—The bacillus was readily isolated in a pure state and proved to have all the characters of a cocco-bacillus of the *Pasteurella* group being non-motile, Gram negative, growing readily and characteristically on ordinary media, but not on potato, not liquefying gelatine, and not curdling milk. The tendency for the organisms in cultures to assume an almost spherical shape, and the appearance of involution forms further justification for the inclusion of the bacillus amongst the *Pasteurellæ*. It should be observed, however, that the colonies on ordinary agar slopes are smaller than those of the chicken cholera bacillus, and further, that the growth on ordinary broth is rather granular, and within forty-eight hours forms a deposit, leaving the liquid clear.

Experiments.—A lamb and a two-year-old cross-bred sheep inoculated subcutaneously with 2 c.c. broth culture of the bacillus, showed slight evidence of general disturbance for a week, the temperature varying between 104.6 and 106.6, with localized inflammatory swelling at the seat of inoculation. The swelling gradually subsided, however, and on slaughter the one four weeks, the other six weeks later, the only lesion observed was the presence of a caseo-purulent irregular mass at the inoculated region, the internal organs being normal. In these lesions the bacilli were numerous, and therefore growths were readily obtained on artificial media.

An aged sheep fed with 5 c.c. of broth culture remained normal, and on slaughter two months later showed no evidence of liver or other infection.

Although sheep, at least cross-breds as these were, failed to develop lesions similar to those observed in the livers of the original cases, it was otherwise with rabbits and guinea-pigs.

A rabbit inoculated with ½ c.c. broth sub-culture died seven days later without previously exhibiting any definite symptoms of illness beyond a slight localized swelling where the injection was made in the thigh. *Post-mortem* examination disclosed a large irregular subcutaneous caseo-purulent area, infiltrating the muscles, which were pale and degenerated. The liver was congested, and thickly studded with enormous numbers of very minute "tubercles" not exceeding a small pin's head in size.

and distributed very uniformly throughout the organ. The spleen was enlarged, pulpy, and "tubercles" similar to those in the liver were disseminated throughout. A few "tubercles" were present in the cortex of each kidney. The pelvic glands were caseous, but otherwise the body was normal. The consistence and microscopic appearance of the hepatic and splenic nodules were identical with those seen in the sheep, and all contained masses of the characteristic bacilli.

A Guinea-pig (29) inoculated with ½ c.c. broth sub-culture died fourteen days later without previously exhibiting any definite symptoms beyond the development of an abscess, which had spontaneously ruptured.

Pyæmic hepatitis. ×58.

On *post mortem* a large irregular caseous area was seen situated subcutaneously extending upwards to the pubis; the precrural lymphatic glands enlarged and caseous. Abdomen distended by a large quantity of clear semi-gelatinous effusion. Liver greatly enlarged, congested, and studded with numerous small caseous "tubercles" varying in size from a point to a pin's head. In addition the organ at the edges and on patches of posterior surface was covered with a greyish false membrane, causing adhesions between the organ and diaphragm. Spleen enlarged to over twice the normal size and showing many

"tubercles" similar to those in liver; fibrinous adhesions between stomach, liver and spleen. Kidneys congested. Thoracic cavity—small quantity of slightly blood-tinged serous effusion with a small patch of pleurisy on left lung. Lungs at base hepatised with small nodules of commencing degeneration.

Another guinea-pig (30) inoculated with ½ c.c. died on the twelfth day. In this case there was a greater quantity of caseo-purulent material at the seat of inoculation, and in addition there was much gelatinous œdema infiltrating the whole tissues of the limb and implicating the abdominal wall. Peritonitis, especially of the parietal surface, characterized by a papular eruption, and adhesions existed between the colon and the abdominal wall. The liver and spleen were mottled with numerous small "tubercles," both organs being congested. The lungs in this case were also implicated, exhibiting several small caseous "tubercles" surrounded by an inflammatory zone. The whole *post-mortem* picture was very characteristic of a guinea-pig infected experimentally with the bacillus of bubonic plague.

Another guinea-pig (82) inoculated with 0.25 c.c. of a sub-culture from the previous guinea-pig (30) developed a large caseo-purulent swelling which ruptured and partially healed. Death, however, occurred eight-four days after inoculation. *Post-mortem* examination showed that the disease had spread slowly; the inguinal, precrural, and sacral glands were greatly enlarged and completely caseous. The peritoneal cavity contained about 30 c.c. of amber-coloured fluid. The liver was much enlarged, congested, and intensely mottled with enormous numbers of small irregular caseous areas, varying in size from a pin's head to a split pea. The spleen was similarly affected and much enlarged, measuring 1½ in. in length by ¾ in. in breadth. The lung showed patches of catarrhal pneumonia with small areas of degeneration.

From all these experimental cases the cocco-bacillus was readily isolated.

General.—It is more than probable that the originally infected sheep may have exhibited nodules (similar to those seen in the liver and hepatic glands) in other organs such as the spleen, kidneys, and even lungs, and it is to be regretted a careful and complete *post-mortem* examination of a number of affected sheep could not have been made. The appearance of the liver

was so striking, however, that one can readily understand a less severe infection of other organs being readily overlooked by the untrained observer.

Although experiments failed to reproduce these lesions in sheep, the evidence adduced from experiments on rabbits and guinea-pigs clearly prove that the lesions were due to the cocco-bacillus which was so abundant and so readily isolated. The distribution of micro-organisms of the pasteurella group is so wide in nature, and their saprophytic nature, together with the fact that under certain ill-understood conditions they may become pathogenic for any animal is so well recognized, that one has no hesitation in concluding that the disease under review originated through an ordinary saprophytic organism becoming pathogenic.

The deaths all occurred within a few weeks of each other, when the mortality ceased and for months there has been no recrudescence.

Further, I am advised by the owner that although a number of sheep of the same flock have been killed for home use, no similar lesions in the liver or other organs have been observed, and as it was the station butcher who originally detected the hepatic lesions, it may be concluded he would have readily observed a similar condition in other sheep.

Though experiments on sheep failed to produce the hepatic lesions it is possible that had they been conducted on sheep of the same breed more success might have attended them. Unfortunately this point was not considered early enough for experiments to be conducted on these lines.

UNIVERSITY OF LONDON.

Preliminary Examination in Veterinary Science for Internal and External Students.

Examiners: Inorganic Chemistry: J. A. Gardner, Esq., M.A., H. R. Le Sueur, Esq., D.Sc., J. E. Purvis, Esq., M.A., and John Wade, Esq., D.Sc. Physics: J. H. Brinkworth, Esq., B.Sc., A. H. Fison, Esq., D.Sc., F. Horton, Esq., D.Sc., M.Sc., M.A., A. W. Porter, Esq., B.Sc., and Professor F. Womack, M.B., B.Sc.

Pass List, July, 1911.

3901. Andrews, Francis John.........................Royal Veterinary College.
3903. Pugmire, Harold.................................Private study.

Clinical Articles.

THE DIAGNOSIS OF AFRICAN COAST FEVER. GLAND PUNCTURE.

By L. E. W. BEVAN, M.R.C.V.S.,
Government Veterinary Bacteriologist, Salisbury, Rhodesia.

THE diagnosis of African Coast fever may be based on (1) the presence of the parasite (*Theileria parvum*) in the red blood cells; (2) the so-called Koch's bodies in the glands, spleen and other organs.

While other parasites closely resemble *T. parvum*, Koch's bodies are diagnostic of African Coast fever, and being an early stage in the life cycle of the parasites, are met with in the gland and spleen some days before *T. parvum* can be detected in the blood.

It is often of the greatest importance that an early decision shall be arrived at as to whether an animal is suffering from the disease, and valuable time may be saved by forwarding gland smears as well as blood smears for diagnosis by microscopic examination at the Veterinary Laboratory, Salisbury.

The animal having been secured against a fence, the head should be drawn round towards the operator, who stands on the left side, and seizes with his left hand the large gland in front of the shoulder. The hair over the gland is removed and the area is washed with an antiseptic and dried. Holding the gland firmly imprisoned under the skin, the operator introduces the needle of a hypodermic syringe into it from below upwards, and, attaching the barrel of the syringe, draws up the gland juice by withdrawing the piston. For this purpose it is advisable to use a needle having a large bore. With some animals it is somewhat difficult to manipulate the syringe single-handed, and it may be found easier to attach a piece of rubber tubing to the needle exerting suction from the mouth.

If the animal is too wild or restless it may be necessary to throw it, and to operate upon the gland of the flank which lies slightly above and in front of the point of the stifle.

The substance removed should then be placed on a clean microscopic glass slide and spread after the manner of a blood-film. The wound should then be washed with antiseptic, and usually heals rapidly.

When no apparatus is available very little damage is done by cutting boldly into the gland and removing some gland substance by scraping with the point of the knife.

EQUINE MELANO-PSAMMOMATA OF THE ENCEPHALON.

By W. M. SCOTT, F.R.C.V.S.
Bridgwater.

On July 1, 1910, at 10 P.M. my assistant was called to see an aged grey mare.

History.—Previous health record was excellent. On the day of illness she had done her usual work without any apparent discomfort.

Symptoms.—These came on somewhat suddenly. She became very restless and broke into a profuse perspiration. Nervous manifestations showed themselves, in extreme irritability, shaking and tossing of the head, knocking it against the wall, boring it in the corner, pawing, biting the woodwork, running backwards and alternated by going round the box at a rapid pace, grinding the teeth, foaming at the mouth, in fact, nearly every conceivable brain symptom was in evidence. The mucous membranes were deeply injected, almost cyanotic, pulse rapid and full, heart's action "hammering." Temp. 104.1° F. The pupils were widely dilated and the retinal vessels distended. Following upon the exhaustion the hyperæmic cerebral symptoms would subside at intervals and their place be taken by depression and coma.

Diagnosis.—Cerebral hyperæmia and probably encephalitis. Cause partly thermic, partly exertion.

On July 2 the acute symptoms had subsided and partial paresis had taken place. The head was dropped, the erectile muscles of the left ear and partly the right were paralysed, the lower lip was pendulous, the muscles of mastication and deglutition were completely paralysed. Labial prehension was also in abeyance, although the appetite to eat was acute. The eyes were dull, and amaurosis appeared to be complete. Locomotion was difficult and gait staggering.

She remained in this semi-comatose state until the 6th, when the muscles of the jaws gave evidence of activity. She also began to suck up liquids and swallow, although with difficulty, some of the fluids returning through the

nose. Progress was slow but satisfactory, and a gradual return of hyperæmia took place. This condition gradually disappeared under treatment, and on July 29 she was sent to work looking as fit and well as usual. This satisfactory condition continued until April 8, 1911, when a recurrence took place, but this time the hyperæmia seemed more passive and less acute than the previous attack.

The most constant symptom now was the continual walking round in a circle and always in the same direction, *i.e.*, opposite to the sun's circuit. On the 13th she died.

Treatment of First Illness.—At the outset venesection was performed, and a dose of aloin et calomel given. The box was darkened, the walls padded and a continual application of cold water to the poll was ordered. Full doses of aconite and pot. brom. were administered, and at a later date these were replaced by small doses of hyd. iod. rub. et strychnini. In addition, she had several subcutaneous injections of normal saline solution, and during her last illness her blood was washed with 2 gals. of sea water.*

Post-mortem.—The case was many miles away and we had to be content with the head and neck sent to us for examination.

The basilar artery was disended in places, giving a varicose appearance, and the walls were comparatively hard and gritty when cut; probably calcareous degeneration had set in. Between the bifurcation of the basilar artery and the branching of the internal carotids a semi-organised blood clot was detected. As would be expected, the meninges contained an excessive quantity of fluid.

The right and left hemispheres of the cerebellum contained an oval-shaped neoplasm; the right weighing 3¼ oz., the left 2 oz. They were dark grey in colour with a glistening surface. On section the tumours varied in colour from dark grey to black, the

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* [As a great believer in the beneficial effects of the injection of normal saline solution, particularly in equine practice, I have practised it for many years. Some two years ago I had a case near the sea, and being desirous of using saline solution, ordered some salt, which we found somewhat dirty. I had a gallon of clean sea water collected and used it instead. Since then, as opportunities occur, we use sea water.

I was rather amused the other day to read in the lay press a descriptive article headed "The '*New*' Treatment by the Injection of Sea Water." But contrary to the directions of that article we neither go out ten miles to collect the water nor use sterilized vessels and have had no untoward results.]

surface being pointed and variegated in appearance. On squeezing an inky-coloured fluid escaped. Against the edge of the knife they gave a gritty feel suggestive of the advanced stages of cholesteatomata.

The horse, I understand, was becoming lighter in colour, but there were no melanotic growths round the anus or other visible regions. I regret a general *post-mortem* was not made.

That the neoplasms had a great deal to do in interfering with the cerebral circulation no one will gainsay, but I have found these neoplasms in the brains of horses which have died from causes other than cerebral, and it only goes to show how accommodating such a delicate structure as the brain is provided it is given ample time to fit itself to its surroundings.

KERATOMA, RESULTING FROM A PICKED-UP NAIL.

By Captain A. J. WILLIAMS, F.R.C.V.S., A.V.C.
Mounted Infantry School, Longmoor.

Subject.—A mounted infantry cob, age 16 years.

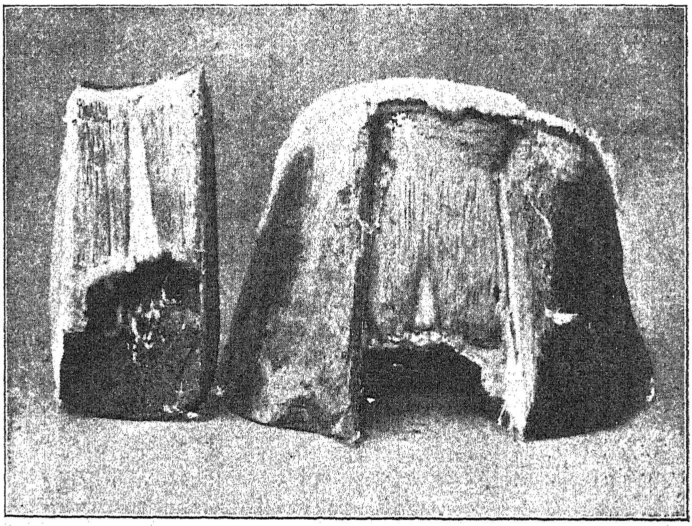
History, etc.—Admitted for treatment on September 4, 1908, suffering from a punctured wound of the near hind foot, caused by a picked-up nail.

Ordinary treatment was carried out, and the animal was sound and sent to work in eighteen days. On January 2, 1910, he was re-admitted, showing suppuration at the seat of the original injury. The affected part was opened up, antiseptic treatment carried out, and the animal was sent to duty on February 27, 1910. The affected part appeared quite sound when the animal was discharged. May 1, 1910.—Very lame again; the sole immediately in front of the frog was under-run at the seat of the previous injury. The horn was discoloured for a considerable distance. I removed the diseased horn from an area of about three inches, and prescribed antiseptic foot baths and antiseptic after treatment. Discharged to duty on June 15, 1910.

On July 26, 1910, lameness reappeared, and from this date to July 10, 1911, the animal was under treatment for 150 days, extending over five periods. Each time there was lameness and suppuration when admitted. The affected part would heal up and appear sound, but after varying intervals suppuration recurred. On June 20, 1911, the animal was cast and the foot

opened up, cocaine and adrenalin being used. After opening up for some distance a hard portion of laminæ was found, pointing to a diseased condition of the laminæ, probably extending to the coronary region. As it would necessitate removing a section of the wall from the coronary band to the toe, in order to effect any permanent result, followed by some months' after treatment, the animal was destroyed, not being worth treatment.

Post-mortem examination revealed a keratoma growing from the horny laminæ and extending from the sole to immediately below the cutigeral groove, with a cavity running up the centre of the growth.



Keratoma.

Remarks.—There was no external evidence of the growth; the wall showed no bulging or any alteration from normal.

At one period, in April of this year, there was suppuration at the coronet in a direct line with the diseased area at the toe. This quickly yielded to treatment; it was the only occasion upon which there was any indication of the disease extending so far up the hoof.

It is interesting to note that 16 months elapsed from the time of the original injury to the next admission for treatment.

I am much indebted to Major A. C. Newsom, A.V.C., Army Veterinary School, Aldershot, for the excellent photograph.

NOTE ON THE PRESENCE OF SCLEROSTOMA EQUINUM IN THE LIVER.

BY CAPTAIN A. J. WILLIAMS, F.R.C.V.S., A.V.C.
Mounted Infantry School, Longmoor.

SOME time ago, when making a *post-mortem* examination on a case of fracture of the cranium, I came across the following conditions:—

The liver was the seat of a localized perihepatitis, and was adherent to the diaphragm. The affected area showed parasitic invasion; parasites present under the capsule and in the liver substance, which was softened where they were lodged and cirrhotic in the vicinity.

Portions of the parasitic tracts were filled with calcareous material and a purulent matter. There was a number of ovoid thick walled cysts between the lobes, and on pressing them sclerostomes escaped with some purulent material.

Specimens were sent to Dr. Stevens, Liverpool Tropical School, who very kindly examined them and also forwarded them to Professor Loos for opinion. Dr. Stevens informed me that they were probably immature sclerostomes, the doubt arising from the fact that they were immature.

The horse has a weaver. I have often wondered whether the chronic liver lesions causing fixation of the organ to the diaphragm and setting up chronic irritation had any connection with the symptoms known as weaving.

FRACTURE OF THE FIFTH AND SIXTH LUMBAR VERTEBRÆ.

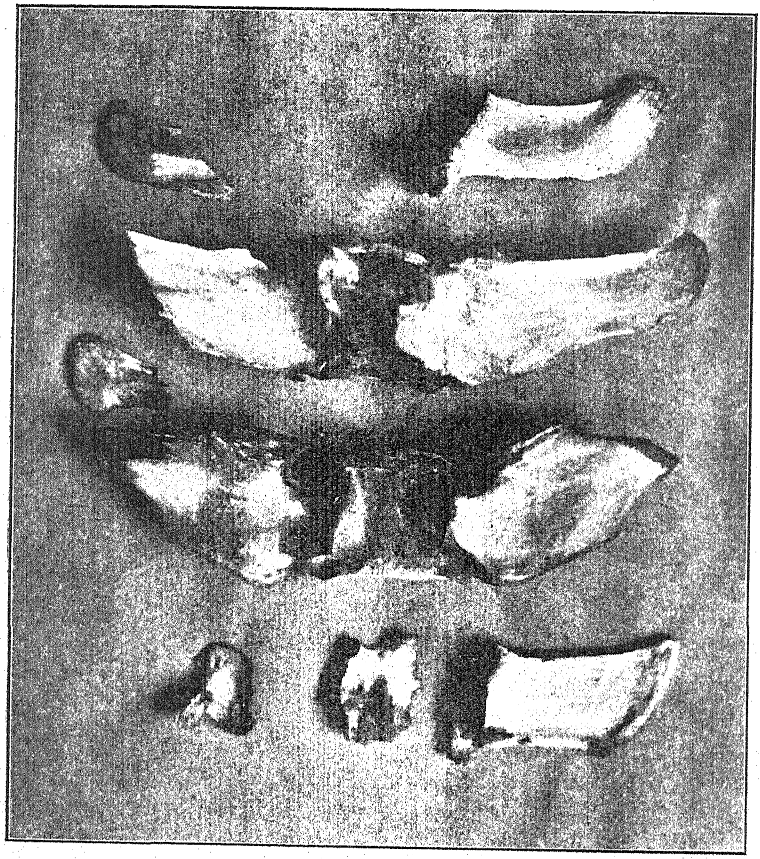
BY CAPTAIN A. J. WILLIAMS, F.R.C.V.S., A.V.C.
Mounted Infantry School, Longmoor.

THE subject of this note, a five-year-old cob, was running in a point-to-point race last April; just before coming to the penultimate jump he dropped his hind legs in a small ditch, fell heavily, and was unable to rise for a little while.

I found the animal on his feet, showing signs of considerable pain, and the near hind leg held off the ground. On moving him forward for a few steps he could put a little weight on the near hind leg. There was occasional knuckling over at the fetlocks and crepitus could be distinctly heard about the quarter region. He was supported and moved along quietly for about

200 yards. The near hind limb was adducted and moved as if there was pelvic injury. This, together with the marked crepitus, which could not be definitely localized, made it impossible to give an opinion until pelvic examination could be made.

It was late in the evening before a float could be obtained. The animal lay down and remained down at the spot to which



Fracture of Vertebræ.

it was moved soon after the accident, and I was informed that when getting him into the float there appeared to be total paraplegia.

On its arrival at the sick lines I again examined the case and found complete paralysis accompanied by anæsthesia of the hind quarters. Examination *per rectum* showed the pelvis to be

intact, fracture of the spine was diagnosed, and destruction carried out.

Post-mortem Appearances.—The superior spinous processes of the 5th and 6th lumbar vertebræ were broken off close to the neural arch, portions of the lateral walls of the neural arch of the 5th vertebra were broken off, the neural arch of the 6th vertebra was completely destroyed.

The extremities of the transverse processes of both bones were fractured on the left side.

I am indebted to Major A. C. Newsom, A.V.C., Army Veterinary School, Aldershot, for the photograph.

EVERSION OF THE BLADDER IN A MARE.

By FREDERICK HOBDAY, F.R.C.V.S.
Kensington, W.

On Sunday, June 25, I was called in consultation by Mr. Frank Thompson, M.R.C.V.S., of Plumstead, to a case of complete eversion of the bladder in a Shire mare. The animal was only 6 years old, the property of a contractor, and had foaled quite unexpectedly on the 23rd about 4 a.m. The foal was born alive and the parturition apparently normal. Nothing unusual was observed until about 8 p.m., when the mare commenced to strain and a reddish-coloured body protruded from the vagina. The owner, thinking that the cleansing had not all come away, called in the advice of Mr. Thompson, who diagnosed eversion of the bladder. The rectum was impacted, but this was speedily relieved with enemas of warm water and an attempt was made to return the everted bladder. Morphia was administered and hot water freely applied, but upon manual manipulation the mare strained so violently that all efforts to return it were unavailing. When first examined it was twisted upon itself and turned back in the vagina, and it was only after several attempts that this difficulty was got over. On the 24th, Mr. Thompson again tried but without success, and on the 25th, when we saw it together (fully forty-eight hours after eversion) it presented a thickened and enflamed appearance of the mucous membrane. The ureters were visible and the urine collected in a pouch of the vagina, being ejected at intervals in a squirting stream when the bladder was touched and the mare strained. Hot chinosol solution was applied, together with gentle massage, and after about an hour the walls became limp enough to attempt reduction. This was done very carefully with the aid at first of the fingers and the

wooden end of an ordinary horse enema syringe. When the length of this was found to be insufficient to return the fundus of the bladder through the urethral orifice Mr. Thompson very ingeniously devised a pessary composed of a small rounded glass pestle firmly tied into the end of a piece of garden hose pipe. This, after being sterilized and well vaselined, was inserted into the fundus in the place of the nozzle of the enema syringe and presently the whole mass returned through the urethra. The bladder was thoroughly douched with cold chinosol lotion and the mare left to her own devices, a warm feed of mash being given to her to occupy her attention.

Recovery has been quite uneventful and there has been no straining or return of the prolapse.

SPASM OF THE DIAPHRAGM IN A COW.

By H. K. KREDO.

On February 18 I was called to a six-year-old Dutch cow, which, according to the owner, had become suddenly ill after feeding and probably had a foreign body in the œsophagus. Patient showed neither salivation nor tympanitis. The breathing was accelerated, 60 per minute, laboured, chiefly abdominal spasmodic and grunting; the mouth held open and tongue hanging out. Inspiration appeared jerky. The respiratory movements corresponded with those of the heart; the lungs were clear; the digestive apparatus healthy. To satisfy the owner the probang was passed and was introduced easily and smoothly.

Kredo diagnosed spasm of the diaphragm in consequence of affection of the sensible branches of the phrenic nerve, probably due to a foreign body. The strong stimulation of the nerve was reflected on the heart-beats due to its situation at the base of the heart, the spasms corresponding with the systole of the auricle. Kredo prescribed magnesium sulphate in the hope that the foreign body would be re-drawn into the reticulum. After two hours the cow settled down and seemed easy. On the following evening after eating, the same symptoms recurred and continued for three hours. Further attacks did not occur.

On April 23 the author was again called to the cow. An abscess had formed at the back of the xiphoid cartilage. On opening up, a large amount of pus was evacuated and a piece of wire brought to light. Kredo considers in consequence that his first diagnosis was correct.

CEREBRO-SPINAL MENINGITIS.

By HENRY B. EVE, M.R.C.V.S.
Folkestone.

Subject.—An aged (about 12-15) roan gelding, 16 hands, a vanner used for carting mineral waters.

History.—The horse had been in regular work daily, in fact, overworked owing to the season here being at its height. The owners had had it over ten years, but it had never had a day's illness up to now, bar lameness due to a sandcrack, which I treated five years ago with a satisfactory result. It was watered and fed overnight, also in the morning early by the carman, and seemed all right as usual, and was duly harnessed to the van along with another, when suddenly it became frenzied and uncontrollable and had to be quickly taken out back to the stable, which was done with difficulty, and I was 'phoned for at 8.45 a.m.

Symptoms, 9 a.m.—Dizziness and vertigo quickly followed by total loss of motor power, which was so complete and sudden that the horse fell prostrate to the ground ere it had been in the stall five minutes before I arrived. The animal had a wild look about its eyes and the injected conjunctiva indicated that the "cerebrum" was affected, although consciousness was only somewhat impaired. The pulse and respirations were accelerated, hyperæsthesia especially at the anterior part of the animal, and chronic contraction of the superior cervical and dorsal muscles were noticeable. The bowels were constipated and urine suppressed. The temperature was elevated, but variable, and intermittent.

1 a.m.—Visited animal and found pulse slow, coma, stertorous breathing and total paralysis present. Temperature subnormal.

Diagnosis.—Cerebro-spinal meningitis (mad staggers).

Prognosis.—Guarded, unfavourable, feared syncope.

Treatment.—Hypo. Inj. physostigmine and pilocarpine given to relieve constipation; passed catheter, and gave sedative draughts chloral hydras, pot. bromid and glycerine ext. belladonna. Locally applied ice-bags to the spine and head. Unable to sling owing to the premises being unsuitable.

Diet.—Laxative, oatmeal and linseed gruel.

Result.—The next day advised the firm to have it shot as the case appeared hopeless; which was done, and unfortunately I was unable to make a *post mortem.*

Abstracts and Reports.

BRIEF REPORT ON THE VETERINARY INSTITUTIONS OF JAPAN.*

By R. F. KNIGHT,
Assistant Chief Veterinarian,
AND
C. G. THOMSON,
Superintendent of the Serum Laboratory.

ORGANIZATION.

THE veterinary work forms one of the divisions of the bureau of agriculture, which is under the administration of the Minister of Agriculture and Commerce, and to it are assigned the inspection of meat, the inspection and quarantine of imported animals, and the control of contagious and infectious animal diseases. Although the improvement of equines is left entirely in the hands of the military department, the remainder of the animal husbandry work comes within the field of the bureau of agriculture, and so much has been done along this line by the importation of foreign stock that in some localities it is difficult to find an animal of pure Japanese blood. Numerous publications pertaining to the veterinary work and organization have been issued in the form of pamphlets and compilations.

RINDERPEST ERADICATION.

The work of the eradication of rinderpest in Japan by the bureau of agriculture is greatly facilitated by existing provisions, not only for the slaughter of animals affected with this disease, but also for those suspected of being infected. Quarantines are maintained against the districts where disease prevails by an efficient police force in such a manner that there is little danger of the extension of the area infected. As a matter of fact, however, the Japanese people have such a hearty respect for law and order that there are few attempts to violate any quarantine regulations that are imposed.

In addition to the slaughter of the animals affected and those directly exposed, and strict quarantine over the infected locality, the injection of anti-rinderpest serum is practised upon the neighbouring animals which are not known to have been directly exposed to the disease. The Japanese officials believe that anti-rinderpest serum is valuable in stamping out an epizootic of rinderpest, and that in the majority of cases a dose of 100 c.c. can be depended upon to confer a passive immunity to the average animal for a period of two or three weeks. It appears that their conclusions regarding the value of anti-rinderpest serum have been drawn principally from literature. They use serum largely on those individuals which they believe are not exposed and where they do not expect the

* *Tropical Agriculturist*, ex *Philippine Agricultural Review*.

disease to appear. The fact that they do not have a large number of cases among animals that have been injected with anti-rinderpest serum seems to be due to the fact that very few of the injected animals are actually exposed. Their tests regarding the efficiency of this serum have been, so far as could be ascertained, the simultaneous injection of large doses of serum and virulent blood. It is believed that the simultaneous injection of large doses of serum will greatly reduce the percentage of mortality in animals that are given virulent blood, but this does not prove that the injection of anti-rinderpest serum will prevent an attack when an animal is exposed several days after the injection of serum. However, some of the Japanese, especially Dr. H. Tokishig, Superintendent of the Institute for the Infectious Diseases of Animals, believe the injection of anti-rinderpest serum to be of little value except when used in connection with other measures, such as the slaughter of infected individuals and those directly exposed, strict quarantine of the infected district, &c. During the past few years outbreaks of rinderpest in Japan have been largely due to the importation of disease from China and Korea. On several occasions they have suffered from small outbreaks which have been traced to these sources, but these outbreaks have been speedily suppressed by stringent measures, and the country has remained free from rinderpest until another importation of the infection. Japan suffered its heaviest losses from rinderpest in 1896, for which year about 7,000 deaths are recorded. This infection was stamped out during the same year, and no new cases appeared until 1899. Since then the disease has appeared from time to time through importations received from the mainland, but it has never seriously menaced the livestock industry. At the present time Japan is entirely free from rinderpest, and to prevent the importation of contagious and infectious animal diseases the Government has installed quarantine stations at the principal ports and has issued stringent regulations governing the inspection and quarantine of animals received from foreign countries.

Quarantine Stations.

One of the quarantine stations, that at Yokohama, was visited. It is small, accommodating only about 50 animals, but as practically no animals except those for breeding purposes are imported at Yokohama, it is of sufficient size for that port. The quarantine station is located about five miles from the central part of the city, and is situated on a small inlet so that live stock can be transported directly from the steamers to the place of quarantine.

The entire station occupies about three-tenths of a hectare of ground, and is surrounded by a tight board fence about three metres in height. In the centre of this area is a building of two stories which is used by the quarantine officials as an office. Around this central structure are several other buildings used for the detention of animals. These buildings are constructed

along sanitary lines, having concrete floors and electric lights. They are well ventilated and offer ample room and comfortable accommodation to the animals. Some of these buildings, those used for the detention of animals which may have been exposed to any of the diseases which are most commonly transmitted by flies, are provided with double screen doors and windows. In addition to these structures, there is a small building located in one corner of the grounds for the isolation of suspected cases of disease, and another similar building which is used exclusively for *post-mortem* work. Bovines and other animals susceptible to rinderpest, imported from foreign countries where rinderpest is known to exist, are held at this quarantine station for twenty days after their arrival. In case rinderpest develops among any of the imported animals during the period of quarantine, the entire herd is slaughtered, and without indemnity to the owner. These regulations do not apply, however, to cattle imported for slaughter, as these are held in quarantine for two weeks only, after which time they are required to be slaughtered within three days.

Slaughterhouses and Meat Inspection.

The cattle dealers and butchers are required to furnish men for slaughtering their animals, and they are charged a moderate sum for the use of the abattoir (for cattle and horses, 1 yen* per head, and for hogs, 25 sen). The buildings connected with the Government abattoir at Tokyo cover about one-fifth of a hectare of ground which is enclosed by a board fence. On two sides of this enclosure are sheds for tying animals which are awaiting entrance to the slaughterhouse. The hours for slaughtering are from 5 a.m. to 10 a.m. There is daily inspection before killing commences of the clothing worn by the men working at the slaughterhouse and of all baskets and other utensils.

The Government inspection of meat consists of a careful *ante-mortem* inspection of the animals and a thorough *post-mortem* examination of the carcase. The *ante-mortem* inspection is conducted in a shed which is near the entrance of the main building and equipped with scales for weighing the animals. Near this shed is a building used as an office for the veterinarians and police officers in charge, and at one end of this latter structure is a laboratory sufficiently equipped to enable the veterinarians to make a microscopical examination of the abnormal tissues revealed by the *post-mortem* examination. This laboratory is supplied with glass jars and preservatives for the collection of interesting pathological specimens which are occasionally encountered.

The main structure, where the butchering is performed, has a concrete floor with deep grooves running in two directions so that the fluids are carried into the main gutters without

* 1 yen = 4s. 3½d.; 25 sen = 1s. 1d.

spreading over a large area of the floor. The walls, to the height of 1⅓ metres, are enamelled tile. About one-third of this building is partitioned off for the dressing of cattle. These are skinned on the floor, and then by means of men and tackles, are hoisted to a track where they are eviscerated. A *post-mortem* examination is made in this room, and if no pathological lesions are found, the carcase is stamped and passed for food. If any abnormalities are revealed, the carcase is run into a separate room for a final examination, and the viscera are carried into another room, where they are placed upon a table and given a thorough examination in order to ascertain whether or not the carcase or any of its parts are fit for human consumption. A room adjacent to the main killing floor is devoted entirely to the cleaning of the viscera. Hogs are slaughtered on the opposite side of this building, and go through the same system of inspection as the cattle. Horses and other animals are occasionally slaughtered, but cattle and hogs form the principal means of supply. Condemned carcases are taken from the slaughterhouse to the crematory, while condemned parts, such as lungs, livers, &c., are rendered sterile by boiling at the slaughter-house and then used for fertilizer.

The Government slaughterhouses are under the supervision of the Police Department, and the stamps with which the quarters are marked bear the words, "Inspected by the chief of the Police Court." The Bureau of Agriculture inspects the meat and decides whether or not it is fit for human consumption. The remainder of the work at the abattoir is under the supervision of the Police department.

The inspection of meat is very thorough, and all meat imported into the Philippine Islands bearing the stamp of the Japanese Government may be considered fit for human food unless affected by decomposition or other changes which have taken place after the inspection. At the Government abattoirs in Japan, a great many parts are condemned on account of the presence of animal parasites. Among those more frequently found are *Echinococcus*, the *Strongylus paradoxus*, and the *Distoma hepaticum*. The first of these often produces in the lungs a marbled appearance, which on microscopical examination somewhat resembles a lung affected by contagious pleuro-pneumonia. The last of the three mentioned is very common, and when this parasite is found the entire liver is condemned. Aside from the parasitic affections, tuberculosis is one of the diseases most frequently discovered. This disease is quite wide-spread in Japan, and the Government has taken important steps toward its control.

Institute for the Infectious Diseases of Animals.

In connection with the control and eradication of animal diseases, the Bureau of Agriculture maintains at Tokyo, under the direction of Dr. H. Tokishig, a laboratory, well equipped for experimental work and the production of serums and vaccines.

The scope of its work is indicated by the following table, showing the quantities of various preparations there during the year 1909:—

Anti-rinderpest serum	litres	400
Anthrax serum	do.	151
Anthrax vaccine	do.	5
Tuberculin	do.	33
Mallein	cubic centimetres	725
Chicken cholera vaccine	litres	40
Swine erysipelas serum	do.	2.5
Anti-streptococci serum	do.	29

The preparation of serum for hog cholera and blackleg is being commenced, but up to the present time very little has been produced.

All the animals at the institute are inclosed in the same yard, so that great precautions are necessary to prevent the spread of the different diseases from one stable to another. For this reason animals are kept in fly-proof sheds which are so constructed as to readily permit a thorough disinfection. The unnecessary passage of attendants from one building to another is prohibited, and all persons entering any part of the grounds, except the laboratory proper, are required to wear rubber boots which are immersed in antiseptic baths upon leaving any of the buildings. The institute covers about one hectare of ground, and is enclosed by a high fence. About thirty-five animals are used in the production of anti-rinderpest serum, besides a few others which were being held as virus carriers.

The general method of the production of anti-rinderpest serum is very similar to that which is being practised in the Philippine Islands, but the process of immunization is a trifle slower. The animals are bled twice during a period of three days about two weeks after the inoculation of 700 or 800 c.c. of virulent blood. No rules are laid down as to the number of bleedings which each animal is to undergo, but the treatment of individuals depends greatly upon the need for serum, the amount of virus available and other factors. As a rule animals are discharged after the second bleeding following inoculation of 3,000 c.c. of virulent blood. The men in charge of this work claim that larger doses of virus do not give a corresponding reaction, but tend to be destroyed rather than absorbed. They maintain that the serum animals may be used for the production of serum indefinitely without any reduction in the potency of the serum produced. After being placed in stocks the animals are bled from the jugular vein by means of a trocar and cannula, the blood being received into a cylindrical glass jar about 10 or 12 cm. in height and of a capacity of about 400 c.c. After the blood is drawn these jars are covered by means of glass plates. They claim that a much better separation of bovine serum is obtained by the use of this type of jar than with all cylindrical ones of a smaller diameter. After the separation of the serum from the solid parts of the blood, it is drawn from the jars by means of a pipette, and without

filtration is sealed for delivery in brown glass bottles of 10 c.c. capacity. It is said that abscess formation seldom follows the injection of this unfiltered serum.

They think that the strength of the individual has much to do with the efficiency of the serum produced, and on this account they use only strong robust bulls as serum animals. Those which give a medium reaction to the inoculation of virulent blood are considered better for the production of serum than those which experienced a very strong or very weak reaction, as those giving a very strong reaction are believed to be weak individuals. Before a serum animal is put into constant use as such his serum is tested on a calf and must protect the calf in doses of 110 c.c. per 100 kilos. against the simultaneous inoculation of virulent blood.

Veterinary Inspection.

Besides maintaining quarantine stations and slaughterhouses and laboratories for the preparation of sera and vaccines, the Japanese Government has gone still further and has established a veterinary course to prepare men for recommending and carrying out the sanitary principles for the preservation of live stock. The course is given in the Imperial University at Tokyo, and for entrance the completion of a course in one of the "higher schools" is required. The period of instruction covers three years of ten months each, and includes the principal subjects pertaining to veterinary and sanitary science.

The main building used by this course is occupied by class rooms, laboratories, and museums. The museums are especially well equipped, containing numerous specimens and models. The anatomical section contains skeletons of all domestic animals, models of the organs of special sense and viscera, and paper models of the head and limbs, showing the relative positions of muscles, nerves, bursæ, ligaments and blood-vessels. These models have been prepared by the professor of anatomy by means of plaster of Paris casts of dissected specimens, and are as natural and accurate as models could be made. In relation to horse-shoeing, there are specimens and drawings illustrating the positions occupied by the bones in various attitudes of the horse. Horse-shoes from various parts of the world are exhibited as well as shoes for correcting all abnormalities. Another section contains animal foodstuffs, both foreign and Japanese, and specimens of nearly all the medicinal plants. Models of horse stables and dairy barns, as well as of models of the different breeds of stock are used for instruction in animal industry. Besides the models and specimens already mentioned, the museum contains a large supply of pathological specimens which have been collected by the faculty.

At the rear of the main structure are three buildings used for hospital purposes. One of these provides stable room for about twenty large animals. Another is used as a small animal house, and contains accommodation for about forty cats or dogs. Both of these buildings contain consultation and operating rooms,

and are fully equipped with instruments and apparatus for clinical work. Horses are shod and clipped at the hospital, the owners being required to pay a small sum for the expense incurred.

As a whole the veterinary course seems to be very thorough and up to date in every way, and compares very favourably with the courses given at the veterinary colleges in the United States.

CONCLUSION.

The Japanese have shown a clear understanding of the importance of animal diseases by the establishment of suitable quarantine stations and abattoirs, and of excellent veterinary colleges and laboratories for the study of subjects pertaining to veterinary work and the education of men to protect their live-stock interest. The enactment of wise legislative measures again demonstrates their realization of the importance of live-stock protection as well as a confidence in the men who are making a life study of this work. This realization of the importance of the live-stock industry and the confidence placed in the men capable of its protection, together with the determination of the veterinarians to put into actual practice all sound theories pertaining to the work, have in recent years prevented animal diseases from causing serious losses. There are many points in the laws, methods, and institutions pertaining to veterinary work in Japan that are worthy the consideration of other countries.

FEEDING AND IMMUNITY IN HÆMORRHAGIC SEPTICÆMIA AND RINDERPEST.*

BY MAJOR F. S. H. BALDREY, F.R.C.V.S., D.V.H., I.C.V.D.

THE following results of experiments as to feeding and watering with hæmorrhagic septicæmia infected material are of very practical importance.

Gaiger [1] recorded that by feeding buffaloes with infected hæmorrhagic septicæmia material they failed to contract the disease and subsequently had an immunity. Baldrey [2] noted that feeding failed to reproduce the disease in rabbits, providing no injury of the buccal mucous membrane was present. If the stomach was rendered alkaline, infection followed, but if normally acid there was no infection. The following experiments were made to explain the possibility of cattle becoming naturally immunized against hæmorrhagic septicæmia:—

Experiment No. 1.

Bulls Nos. 2506 and 2549 received each in water 1 c.c. of an agar washed emulsion of a forty-eight hours growth of living hæmorrhagic septicæmia. The number of organisms given in each case was 779,000. The emulsion was administered as a drench; forty-eight hours after they received again a like quantity.

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* *Journal of Tropical Veterinary Science.*

As a result of this no clinical symptoms were manifested, neither was there any appreciable rise of temperature.

Eleven days after the last administration these two animals each received 0.1 c.c. of a forty-eight hours broth culture subcutaneously. Temperature was irregular for three days but never higher than 39.4° C. Slight swelling at the seat of inoculation, but no systemic disturbance. Recovery was complete and uneventful.

A control inoculated with exactly the same quantity of the same culture died in thirty-four hours.

Experiment No. 2.

Bulls Nos. 3136, 3132, 2541, 3232, 3166 and 2525 each received in food 1,760,000 living organisms of hæmorrhagic septicæmia and forty-eight hours later the same quantity. In order to ensure complete ingestion the animals were kept without food for twelve hours, and the emulsion of bacteria was then mixed with about 1 lb. of damp meal. Every particle was eaten up out of the tin dishes in which it was mixed. No. 3166 died of hæmorrhagic septicæmia on the third day after the second dose of bacteria. The organism was recovered from the heart's blood.

The remainder showed no appreciable symptoms and were tested for immunity thirteen days after the last administration of organisms. The dose given was 0.1 c.c. of a forty-eight hours broth culture subcutaneously. A control was given the same amount.

Result.—Control died in twenty-four hours. Bull No. 2525 died in thirty-two hours. Pure culture of hæmorrhagic septicæmia recovered from heart's blood of each. The remainder recovered. Their temperature rose 1—2°, and there was swelling at the seat of inoculation. The former persisted for two to three days and the latter for the same period, but recovery was spontaneous and uneventful.

Experiment No. 3.

Bulls Nos. 3241, 1924, 1107, 1915, 2523, and 2507, each received in water 1,760,000 living organisms of hæmorrhagic septicæmia, and forty-eight hours later a second administration of the same quantity. The animals were kept without water for twelve hours. The emulsion mixed in about half a gallon of water in a bucket and they then drank the whole of this quickly. These methods of allowing the animals to feed and drink naturally, were adopted to obviate the possibility of injuring the mucous membrane of the mouth by administering the material from a drenching bottle. No clinical disturbance was manifested from the above treatment.

On the thirteenth day after the last dose of organisms, each animal received 0.1 c.c. of a forty-eight hours' broth culture subcutaneously. A control received the same amount.

Result.—Control died in twenty-four hours. No. 2523 died in sixteen hours. Pure culture of hæmorrhagic septicæmia, recovered from heart's blood in each case. The remaining five

animals recovered without any marked symptoms beyond a 2° rise in temperature and a slight swelling at the seat of inoculation.

In all the above experiments animals were kept in an absolute state of isolation so that the possibility of outside contagion or infection was impossible.

Conclusions.—Of bovines which ingest virulent hæmorrhagic septicæmia material in relatively small quantities 7.1 per cent. contract the disease; of the remaining 92.9 per cent. there are 84.7 per cent. immune to it. The probable method of contracting the disease by ingestion would appear to be when an injury to the mucous membrane of the mouth has occurred and then infection amounts practically to a subcutaneous inoculation. This result has an important bearing on natural immunity and may account for the numbers of animals which in the plains resist infection.

Remarks.—As to the vaccination by the ingestion of virulent material it is interesting to inquire how it is produced.

Baldrey [2] has shown that in the presence of acid the organism was rendered harmless to the rabbit by ingestion, but when the stomach was washed out with an alkaline solution infection and death took place. Hartley working in this laboratory has shown the effects of various solutions of acid, alkali and bile *in vitro* upon the hæmorrhagic septicæmia organism as follows:—

The Effect of Acids, Alkalies and Bile Salts on the Growth of Hæmorrhagic Septicæmia Method.

The bouillon used was standardized to +10 on Eyre's scale. A series of 100 c.c. flasks, each containing 25 c.c. of broth were inoculated, each with five drops from a twenty-four hours' old culture of hæmorrhagic septicæmia. A second series of flasks, each containing 25 c.c. of the fluid, the bactericidal power of which was to be investigated, were also prepared and sterilized, and maintained at 37° C. for forty-eight hours, in just the same way as the broth cultures of the organism. The fluid under investigation (acid, alkali, &c.) was added to one of the flasks containing the bouillon culture of hæmorrhagic septicæmia, and subcultures on broth were made at definite intervals (usually 10-minute intervals up to one hour and a final subculture after four hours). The concentration of the acid, alkali, &c., in the original fluid being known, the final concentration of the acid, alkali, &c., when mixed with the broth culture, was readily calculated.

The tubes (subcultures) were grown for three days at 37° C.

The same results in hydrochloric acid were obtained by a parallel series of experiments to which, in addition to the acid in the concentration stated, pepsin was added.

The bile-salt solutions were made up so as to contain equal parts by weight of the sodium salts of glycocholic and taurocholic acids. The bile-salt solutions had an alkaline reaction.

It is seen from the above that the hæmorrhagic septicæmia organism is killed in ten minutes by a .09 per cent. solution of HCl., in ten minutes by a 1.0 per cent. solution of sodium carbonate, and in four hours by a 2.0 per cent. solution of bile salts.

.15 per cent of lactic acid fails to kill in four hours. It was considered of interest to determine how protective vaccination was accomplished by the ingestion of living organisms and if the virulent material was killed by such ingestion and at what part of the digestive tract. To demonstrate this and control the *in vitro* experiments of Hartley the following observations were made.

Bulls Nos. 3579, 3520, 3843, 3711, and 3627 were fed at 6 a.m. on July 23, 1910, with 2 c.c. of hæmorrhagic septicæmia emulsion washed off an agar forty-eight hour growth in normal saline.

Experiment I.—Four hours afterwards bull No. 3627 was killed. Inoculations were made in rabbits from the contents of the rumen, fourth stomach, small intestines and large intestines.

The method employed was to take a large quantity of the contents, mix thoroughly with sterile water, pour off the liquid contents, pass through blotting paper, and then centrifuge. Each

Substance	Concentration	Result	
		Growth after	No growth after
	%		
Hydrochloric acid	0.04	4 hours	—
	0.05	50 minutes	4 hours
	0.06	50 ,,	4 ,,
	0.07	20 ,,	30 minutes
	0.08	10 ,,	20 ,,
	0.09	—	10 ,,
Lactic acid	0.15	4 hours	—
Sodium carbonate	0.3	4 ,,	—
	0.4	50 minutes	4 hours
	0.5	30 ,,	40 minutes
	0.75	10 ,,	20 ,,
	1.0	10 ,,	20 ,,
	2.0	—	10 ,,
Bile salts	.05, .1, .2 .5, 1.0	4 hours	—
	.2	40 minutes	4 hours

rabbit was inoculated with 1 c.c. of the sediment so obtained subcutaneously.

Experiment II.—Eight hours after feeding bull No. 3711 was killed and exactly the same procedure adopted.

Experiment III.—Twelve hours after feeding bull No. 3843 was killed and the same inoculation carried out.

Experiment IV.—Twenty-four hours after feeding bull No. 3520 was killed for the same series of examination and injection.

Experiment V.—Forty-eight hours after feeding bull No. 3519 was treated as above.

The results of the *inoculations from the contents of the rumen* of all the above bulls caused death in the inoculated rabbits by hæmorrhagic septicæmia afterwards verified by isolating the organism and re-testing. This proved that the organism re-

mained in the rumen for at least seventy-two hours and retained its virulence for that time. The contents of the rumen are therefore never of a pronounced alkaline or acid concentration, as the hæmorrhagic septicæmia organism remains alive and virulent, and it is probable that the organisms multiply in this stomach. This is confirmed by the results obtained by Smith [4], who found that the reaction of the rumen was always alkaline.

Inoculations from the Fourth Stomach Contents.—The same routine was carried out with the contents of the 4th stomach as was done in the rumen. Rabbits inoculated every four hours from the contents up to the seventy-second hour. The result was that only two rabbits died of hæmorrhagic septicæmia, one at twenty-four hours after feeding, and the other from contents taken forty-eight hours after feeding. None after that time. This experiment demonstrates that organisms of hæmorrhagic septicæmia were present in the true stomach twenty-four hours after ingestion, and that they had not all been killed by contact with the stomach juices, and also shows that the acidity of the stomach cannot often be so high as .09 per cent. of HCl.

Contents from the small intestines were taken at intervals of four hours after ingestion and tested upon rabbits. As a result it was seen that no living hæmorrhagic septicæmia organisms could be obtained from the small intestine. This demonstrates the passage of material through the gut is very rapid, otherwise all the hæmorrhagic septicæmia organisms must have died, whereas it was subsequently found that living organisms were recoverable from the large intestine. The deduction is that hæmorrhagic septicæmia organisms remaining for any length of time in the small intestine are killed or they would have been recovered by the above experiment. Smith [5] shows that the acidity of the true stomach with a meal diet is .049 per cent, and Hartley's *in vitro* experiments have shown that .04 per cent. of HCl is incapable of killing hæmorrhagic septicæmia even in the presence of pepsin in four hours. It is unlikely that any organisms remain for this length of time in such an acid medium, but it is possible that there is some destruction of these organisms while in contact with the acid of the stomach. The alkalinity of the intestines is never likely to be of a sufficiently high concentration to kill, as .3 per cent. of alkalinity in Hartley's experiments showed growth after four hours' contact. The acidity of the stomach alone is therefore capable of killing every organism, but this result is attained over a large number of bacilli in the small intestine by the process of digestion. By this means organisms appear to be digested and absorbed as a proteid. The passage of the small intestinal contents and that of the stomach is, however, so rapid that many organisms escape into the large intestine as they have not had a sufficiently long enough time in contact with the digestive juices to be killed or digested. The time occupied by the passage through the small intestine of those organisms that escape alive and virulent into the large intestine is less probably than three hours. It is clearly shown that living organisms were found in the large intestine

in under eight hours from the time of ingestion (*vide* experiments on large intestine).

Experiment on Large Intestine.—Contents from the large intestine were taken at four-hour intervals and tested upon rabbits in the same way as above. Hæmorrhagic septicæmia was found in virulent form in eight hours after administration per os, also in twelve hours and seventy-two hours. Out of six rabbits inoculated at varying times, three died of hæmorrhagic septicæmia, afterwards verified by cultivatian and sub-inoculation.

The object of the above experiments, *i.e.*, to find out in what way immunity is produced by feeding on virulent culture is, I think, satisfactorily established. It was thought that the organisms were killed in their passage through the stomach, absorbed as dead organisms and in this way act as an antigene. This view was not entirely correct as has been shown by living organisms being recovered from the large intestine, so that all the bacilli were not killed. Examination of the blood by inoculation and culture have failed to find living organisms therein; it therefore appears that vaccination is produced only by dead organisms. That this absorption of dead organisms takes place from the small intestine and that the juices of the small intestine are capable of at least inhibiting the growth and virulence of hæmorrhagic septicæmia, providing their stay in the gut is sufficiently long. The large intestine is resistant to infection inasmuch as though organisms of hæmorrhagic septicæmia remain alive and virulent therein, they are not capable of causing infection through its walls. It would appear that only dead and digested bacilli are absorbed into the system and by this vaccination is produced.

An interesting point from a physiological point of view is revealed in the rapidity with which such ingested solid material is capable of reaching the large intestine of ruminants. It will be seen that hæmorrhagic septicæmia organisms were recovered from the large gut as early as eight hours after ingestion. This appears quick considering that rumination has to take place before the food is passed on from the rumen. No observation was made between four and eight hours so that it is possible that they could have been recovered even earlier than eight hours. As living organisms were obtained from the large intestine, the necessity of deciding if animals which have ingested virulent material are "carriers" of the infection was evident. To observe this point an animal was given 2 c.c. of a forty-eight hours' broth culture and the fæces examined on alternate days for bacteria. Hæmorrhagic septicæmia organisms virulent to the rabbit were recovered from such fæces, up to the fifteenth day after ingestion. The technique adopted in the recovery of the organism was the same as that for the intestinal contents.

Examination of fæces were made up to the twenty-third day, but no hæmorrhagic septicæmia could be demonstrated after the fifteenth day from the date of ingesting virulent material.

It is clear from this that an animal may remain a carrier of infection by the fæces for fifteen days at least after the inges-

tion of hæmorrhagic septicæmia organisms. This points to the fact that multiplication or growth of hæmorrhagic septicæmia takes place in the large gut of ruminants, otherwise it would not take so long for their elimination. The amount of dissemination of the disease is therefore by this means incalculable and such animals are a dangerous focus of infection of the disease. The necessity of destroying by fire all fæces from animals during an outbreak and for fifteen days after is very forcibly pointed out.

The above may explain the method of dissemination and suggests again the possibility of insects (ticks) being actively concerned in it. The infected fæces contaminate grass upon which the tick rests during moults. The tick is infected by this means and becomes the active agent in dissemination. It may also explain the immunity that is acquired by some bovines. They feed upon grasses infected as above explained and unless there is a wound of the mucous membrane contract an immunity by ingesting this material. In the event of a slight abrasion to the mouth there would be a direct and fatal infection providing immunity had not already been established.

With regard to the practical utility to be gained from feeding with virulent material as a means of obtaining immunity, the above experiments show that it would be anything but a safe method to recommend. The results demonstrate that some losses are inevitable and in this differ from those obtained by Gaiger [1]. Only fourteen animals were used in my experiments and it is possible that with greater numbers greater losses would be shown.

Experiments in Rinderpest.

The possibility of establishing immunity to rinderpest by the administration of virulent material through the medium of food or water led to the following experiments:—

Experiment I.—Bulls Nos. 4208, 4211, 4212, 4210, 4213, and 4209 each received in a small quantity of food 1 c.c. of virulent defibrinated blood, from which the serum as collected by standing; forty-eight hours afterwards they each received 5 c.c. of virulent blood treated in the same way. A slight reaction followed. The temperature rising to 39.2° on the fifth day after the second dose, and gradually becoming normal about the tenth day. None of these animals lost weight or showed any appearance of illness to an ordinary examination, beyond the slight rise in temperature as shown by the thermometer. On the seventeenth day they received 0.5 c.c. of virulent blood subcutaneously. Control the same.

Result.—The control showed vesicles on the fifth day; bulls Nos. 4208 and 4212 showed vesicles on the fifth day; bulls Nos. 4211 showed vesicles on the fourth day; bulls Nos. 4210 and 4213 showed vesicles on the sixth day; bull No. 4209 showed vesicles on the seventh day.

Experiment II.—Bulls Nos. 4215, 4214, 4218, 4219, 4216, and 4217 each received in drinking-water 1 c.c. of virulent de-

fibrinated blood, and forty-eight hours afterwards 5 c.c. in the same manner. The reaction from this was the same as in the Food Experiment I.

Bull No. 4215 died on the fifteenth day from asthenia. Bull No. 4217 showed vesicles of rinderpest on fifteenth day. Remainder all tested for immunity by the subcutaneous inoculation of 0.5 c.c. of virulent blood and a control the same exactly.

Result.—Control showed vesicles on the fifth day. No. 4219 showed vesicles on the fifth day; No. 4214 showed vesicles on the seventh day; No. 4218 showed vesicles on the seventh day; No. 4216 showed vesicles on the 9th day.

Conclusions.

The feeding of susceptible bovines upon virulent rinderpest material fails to induce immunity, but the conclusion arrived at by Experiment II is that ingestion of such material in a fluid media tends to lengthen the period of incubation. It will be seen that one animal did not develop vesicles until the ninth day.

Controls are absolutely regular on the fifth day. In the food experiment the longest was the seventh day. Such an immunity is, however, of very little practical importance.

Bull No. 4217 contracted rinderpest on the fifteenth day. As all the series of animals were kept in absolute isolation, infection must have been gained, from either auto-inoculation, or during or soon after the administration of the virulent material in the water.

In continuation of the above experiment it was considered advisable to test the immunizing properties of heated virulent blood, with a view to its vaccinating properties by subcutaneous inoculation. Observation showed that:—

Virulent defibrinated blood heated at 45° C. for thirty minutes did not lose its virulence.

Virulent defibrinated blood heated at 50° C. for thirty minutes loses its virulence.

Virulent defibrinated blood heated at 55° C. for thirty minutes loses its virulence.

Virulent defibrinated blood heated at 60° C. for thirty minutes loses its virulence.

By heating at anything over 55° C. there was so much hæmolysis that the fluid was not considered suitable as a vaccine.

Therefore corpuscles heated to 50° C. for half an hour were used as a vaccine; 1 c.c. of this inoculated subcutaneously failed to produce any immunity when tested fifteen days after inoculation. Semner found that he could produce immunity by this means.

Further experiments are proceeding with larger doses of heated blood and will be reported in due course.

Virulence of Blood.

In the course of the above research it was desirable to know which part of the blood was most virulent.

We know that defibrinated and centrifuged blood is extremely

virulent, and the following experiments were made to see if the serum was also:—

Experiment I.—Serum was prepared by defibrinating blood and centrifuging it. The serum resulting was coloured red, showing that considerable hæmolysis had taken place.

One c.c. of this was inoculated subcutaneously into bull No. 3744. Result, vesicles on the seventh day.

Experiment II.—Serum prepared by allowing blood to clot and standing in the cold room. This was quite clear; observed no trace of hæmolysis. 1 c.c. inoculated subcutaneously into bull No. 3968. Result, nil. The bull was tested for immunity twenty-two days after and showed vesicles on the eighth day, demonstrating that the serum produced no protection.

Conclusion.—That the virulence of rinderpest is contained in the red corpuscles and is not free in the plasma providing no hæmolysis has taken place. Theiler [3] states that serum does not contain any virulent material and this result is confirmed. It is also demonstrated that the inoculation of such clear serum is incapable of producing any immunity.

I have to thank Mr. Cross and Dr. Hartley for their valuable assistance in carrying out the above experiments.

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THE FEEDING OF EQUINES.

BY J. M. CHRISTY.
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IN dealing with this matter it is important to understand what is meant by a well-balanced ration, namely, a diet containing a proper proportion of nitrogenous constituents or albuminoids, called protein, to non-nitrogenous substances, called carbohydrates or fats.

The most important constituents of the food for equines are protein, carbohydrates, and fats, the proportions being about one of protein to from six to seven of carbohydrates and fats.

A ration for equines should contain the constituents required for the building up and sustaining of the body, in addition to supplying the power and energy to enable them to do the work expected from them.

In connection with this subject, Mr. Herbert Ingle, B.Sc., F.I.C., F.C.S., wrote in the *Transvaal Agricultural Journal* (volume vi., page 51): "It may be well to recapitulate the conditions with which the ration of an animal should comply. These are:—

"(1) It should contain protein carbohydrates, and fat in suitable proportion for the requirements of the animals. These requirements differ somewhat according to the age, kind of animals, conditions under which they are kept, and other circumstances.

"(2) It should contain in proper quantity, and especially *in proper proportions*, the various mineral ingredients required for the nutrition and formation of bone, and for the carrying on of the various life processes of the animal."

The above was written in connection with bone disease in animals, but I desire to use it in this article as it indicates in a scientific manner the food we should give to the domesticated animals.

As I desire to make this as far as possible a practical article, I refrain from giving tabulated analyses of the various foodstuffs—which can be got from Mr. Ingle's published articles—and will simply confine myself to the undermentioned three tabulated statements and particulars as to how equines are fed in some large establishments in the Transvaal:—

SCALE OF FEED PER ANIMAL PER DAY.

Horses.—Mixed feed, 19 lb.; oats, 3 lb.

Mules.—Mixed feed, 17 lb.

This "mixed feed" is made up of 12 lb. forage and 7 lb. mealies for horses, and 10 lb. forage and 7 lb. mealies for mules. When green stuff (such as lucerne or barley) or teff hay is obtainable, an equivalent, according to price, is substituted for 2 or 3 lb. mixed feed.

STATEMENT OF COST PER HEAD OF MULES AND HORSES FOR THE SIX MONTHS ENDED DECEMBER 31, 1910.

	Horses.			*Mules.*		
July	£1	15	8.346	£1	3	8.413
August ...	1	12	10.525	1	1	3.505
September ...	1	9	11.850	1	1	3.344
October ...	1	11	8.688	1	3	4.315
November ...	1	14	1.365	1	5	10.777
December ...	1	12	1.140	1	6	7.196
Monthly average for the six months ...	1	12	8.985	1	3	8.260
Cost per head per day ...	0	1	1.096	0	0	9.475

1910.					
August	248 animals for 31 days,	£321	8	2
September	288 " " 30 "	323	11	7
October	272 " " 31 "	348	4	0
		£993	3	9

Average cost per animal per day, 9 3-5d.

Fed during three months (August, September, and October):—

Bran, 600 lb.; chaff (cut straw), 111,347 lb.; green forage (lucerne), 109,335 lb.; cut forage (oat-hay), 12,990; grass hay, 101,972 lb.; mealies (crushed), 220,500 lb.; total, 556,744 lb.

Average weight in food per animal per day:—

10 lb. mealies, 5 lb. chaff, 5 lb. grass-hay, 2½ lb. lucerne and bran; total, 22½ lb.

SCALE OF FEED PER ANIMAL PER DAY.

	Grain.	Hay.	Bedding.	Salt.	Approximate Cost.	
	lb.	lb.	lb.	oz.	s.	d.
(*a*) Artillery and draught ...	10	11	8	1	1	3
(*b*) Cavalry	9	10	8	1	1	2
(*c*) Mounted infantry	8	9	8	1	1	0½
(*d*) Remounts	5	7	8	1	0	7½
(*e*) Working mules	7	7	6	½	0	10½
(*f*) Grazing mules when grazing is "good"	2	0	6	½	0	2½
(*g*) Grazing mules when grazing is "indifferent"	2	4	6	½	0	5
(*h*) Grazing mules when grazing is "bad"	4	8	6	½	0	8¾

The scale of rations given above is the standard one. Officers commanding units may draw green forage, linseed, bran, &c., to vary the animal's diet at their discretion, in lieu of any part of the ration, provided that the total cost of the ration is not increased. The majority of units give their horses a warm bran mash once a week. The grain portion of the ration is governed by the price. At stations where oats can be purchased cheaper than mealies they form the standard ration.

Translations.

TRANSMISSION OF INFECTIOUS DISEASES TO ANIMALS IN THE EXERCISE OF VETERINARY MEDICINE.

BY MAJOR M. P. REMLINGER.

LIKE the doctor, the veterinary surgeon exercises his art at his particular domicile or in that of his client. The doctor appears to transmit infectious complaints primarily by his hands, which he is content almost always to wash rapidly in soap and water—quite an insufficient measure—then by his clothes, and beard, on which in speaking, coughing and sneezing (scarlatina, diphtheria, measles, mumps, etc.), the patient projects droplets of virulent material. This method of contagion presents itself equally in veterinary medicine. More even than the doctor, the veterinary surgeon is exposed to the taking up of pathogenic microbes in his hands or

clothes; he often carries, like his confrère of the superior animals, a beard exposed to the same soiling; he washes his hands no better than him, nor changes his clothes after each visit to a suspect. Amongst illnesses capable of being transmitted from sick animals to healthy ones, may be mentioned aphthous fever, peripneumonia, rinder-pest, swine fever, erysipelas, glanders, horse-pox, etc. His actions bring many dangers in their train when disinfection of the hands is not assured, *e.g.*, examination of buccal, ocular, pituitary mucosa; investigation of dentition or dentistry, the appreciation of the dryness of the muzzle. In veterinary medicine, however, the danger of clothes, hands and beard appears greatly excelled by that of the boots, and how should it be otherwise? Theoretically all affections in which the microbe can be found in fecal matter and the urine may exist some hours outside the organism, and in the end contaminate the animal by the respiratory or digestive tract, and can thus be transmitted by the contagious products which the veterinary surgeon carries from stable to stable adherent to his boots. In the West, above all, aphthous fever; in the East, rinder-pest is propagated in this fashion. In Turkey the visit to a healthy stable of a real or soi-disant sanitary inspector is often the point of departure of a veritable disease disaster. In many of our countries owners have grasped the relation of cause and effect between the passage of a veterinary surgeon and the appearance of foot-and-mouth disease; when the epizootic rages they avoid calling in the practitioner as much as possible. The danger of the boots is by no means limited to these two diseases. Erysipelas, swine fever, symptomatic anthrax, diarrhœa of calves, glanders can be equally transmitted in this way.

We shall be brief on the transmission of infectious illnesses by means of certain surgical instruments or medical apparatus. This mode of contamination is too well known to be insisted on, and it is disappearing. Everybody knows to-day that the flame or immersion in an antiseptic is necessary for disinfection of instruments, and that a temperature of 120°, or in case of impossibility, prolonged boiling is absolutely necessary.

It will suffice to name the principal diseases communicated by instruments (tetanus, septicæmia, glanders, pasteurelloses), the operations which have most often given place to accidents (castration, amputation of the tail, subcutaneous inoculations, application of setons) the instruments most incriminated (clams, castration forceps, trocars, seton needles, catheters, shears, twitches, hobbles, thermometers, &c.).

What are the precautions the veterinary surgeon should take? It appears to me to be unreasonable to ask a veterinary surgeon to sacrifice his beard; he should wash it with care after he has been in contact with an animal affected with a transmissible malady. It is easy to keep his nails cut and clean, to carry cresylic soap and a bottle of this antiseptic or of one of its derivatives, and to proceed to a thorough disinfection of the hands after examining every contagious malady. A special smock is recommended also in these cases, which can be cleaned and disinfected.

It is most necessary, however, to avoid spreading contagion by the boots and trouser bottoms. They may be disinfected, including

the soles, by means of a large tampon of wool on a wooden or iron rod soaked in a solution of cresyl. A pair of rubber boots which can be put on, taken off, and disinfected at will, serve the same purpose. Such a costume will enable him to be easily recognized, be an advantage to his clients, and increase his prestige. It will, by its example, give him greater authority to have prophylactic measures taken in contaminated places, particularly to forbid access to farms, stalls, stables or piggeries, of butchers, horse-dealers and merchants of all kinds in agricultural trade who are so often, as everybody knows, vehicles of illnesses.

(*Revue Générale de Médecine Vétérinaire.*)

ALOPECIA AREATA.

By Staff Veterinary Surgeon POHL.

A horse of the third squadron was given three prophylactic washings with 1 per cent. sublimate water with the addition of hydrochloric acid. This was done on account of the occurrence of lice in the stable. Five days after the last washing there was wide-spread falling out of the hair over the whole surface of the body including the head. The brown hair had lost its customary lustre and appeared covered with an asbestos-like powder (scales) and the hair and its bulbs could be easily pulled out with the fingers. Within two days there arose, especially on the rump and muscles of the limbs, hairless, irregularly-placed, isolated spots of a circular shape and as big as a plate. Itching was not present and scabs did not form. Treatment consisted in removing the falling hair by swabbing the skin with cloths soaked in creolin water. The bald places were sopped daily with 1 in 100 salicyl spirit. After eight days fresh hair appeared, and within three weeks the loss was remedied; the hair was growing everywhere during this time. The extraordinarily quick, almost sudden spread of the falling out of the hair over the whole body which produced in quite a short time very large bald spots on the skin, the quick growth of new hair and the isolated nature of the case excludes *herpes tonsurans*. It seems certain that there was general circulatory disturbance in the skin and on that account faulty root nourishment of the hair, which caused it to fall out. This case and its treatment seem worth recording.

(*Zeitschrift für Veterinärkunde.*)

[*Translator's Note.*—Cases of this description may be described as rare. They are so seldom met with that one is apt to forget that they may occur. The translator has seen one such case as that described herein which followed an attack of influenza and sore throat and was accompanied by laminitis. Talking to a veterinary surgeon of forty years' experience about the matter, he recalls *one* such similar case in his long career. They are apt to puzzle one when they do occur, but the smooth, hairless, non-scabby and non-irritable nature of the complaint excludes a notifiable skin disease.]

POISONING WITH RED LEAD.

By Staff Veterinary Surgeon KLINGBERG.

The owner of a dairy in the neighbourhood of K. had built a new cow-house. The iron beams and pillars had been painted with red lead in order to preserve them from rust—four pillars stood near the crib. Of eight animals standing near these pillars six fell ill, namely, two cows, two stirks and two yearlings. The owner had put the animals in their stalls immediately after painting the beams, so that they licked the wet paint. Two days later the first appearance of illness occurred. The cows were very ill at the beginning, the other four animals showed slighter symptoms of poisoning. A cow died after three days' illness. A veterinary surgeon had not been immediately called in by the owner. The latter had given all the patients medicine under the idea that they were suffering from constipation. I was called in twenty-four hours after the death of the first animal. After surveying the shippon and examining the animals I told the owner that these were not cases of stoppage, but of severe poisoning through licking the red paint. In the remaining sick cow I found the following state: The rectal temperature was comparatively low, 37.2° C.; the pulse rate 40 to 44, pulse irregular and weak; breathing quickened and laboured; eyes were staring, pupils widely dilated; taking of food *nil*; rumen movements scarcely hearable. In spite of appropriate means obstinate constipation persisted for three days. Periodical twitchings of muscle appeared at shoulder, neck and head. The cow then made continued champing movements accompanied by copious flow of saliva. She pressed forward and tried to climb the crib.

The remaining four patients showed slight signs of poisoning. There was more or less diarrhœa due to the owner's medicine. Dilated pupils, subnormal temperature, pulse rate 48 to 72. Both yearlings had sideways champing attacks.

Treatment.—Dilute sulphuric acid in linseed mucilage and in the drinking water; milk with white of egg. The cow and a yearling received chloral hydrate in the water and in linseed mucilage. Both yearlings and the stirks were all right after six to fourteen days. The cow died after eight days' continuance of illness.

On *post mortem* there was the following: Cadaver greatly blown up; subcutaneous veins filled with blackish red blood. On the peritoneum and intestinal walls patchy and spotty hæmorrhages. The intestinal canal was almost empty, the mucosa covered with greyish red slime in great quantity. The third stomach filled with firm masses of food. Liver not enlarged. The lungs in the inspiration stage and very rich in blood. In the bronchi and air cavities a fine, bubbly, tenacious, yellowish red foam. On the pleura epi- and endocardium punctiform hæmorrhages. The right chamber of the heart was filled with thick black tarry blood.

(*Zeitschrift für Veterinärkunde.*)

[The *post-mortem* appearances in such cases as these simulate

anthrax somewhat. The translator remembers a great difference of opinion where some cows and calves died on the marshes in the Eastern Counties. It was a question whether they had eaten raddle used to mark sheep, or whether they had died of anthrax.]

A CASE OF STRANGLOUS ENCEPHALITIS.

By BOUET.

STRANGLOUS encephalitis of the horse is not extremely rare. It is generally the complication of a form of clinically discrete strangles; it can even constitute the only objective manifestation of it as in the following observation.

Santol, an Anglo-Arabian horse, fell like a log on his left side on two different occasions. He had fever, inappetence and coma. The fourth day excitation crises preceded death. The autopsy revealed an abscess in the white substance of the left hemisphere. Examination of sections of the diseased tissue showed congestion and inflammation; the localization of microbian agents could also be established. In sections obtained by inclusion these agents have been easily coloured by Gram's method. The streptococci were clearly localized in the lymphatic perivascular sheaths, which enclosed veritable cultures. They appeared under the form of short chains; some had a diplococcic aspect. They were disposed for the most part between the white globules, but were also to be found in the interior of the leucocytes whose protoplasma is then hypertrophied.

(*Revue Vétérinaire Militaire.*)

Letters and Communications, &c.

Mr. E. Wallis Hoare; Dr. D. A. Hughes; Mr. E. Moss; Capt. Williams; Mr. A. W. Noël Pillers; Mr. L. W. Wynn Lloyd; Dr. O. Charnock Bradley; Professor J. F. Craig; Professor J. J. O'Connor; Mr. W. M. Scott; Mr. H. B. Eve; Mr. F. Bullock; Mr. S. Skelhorn; Mr. L. M. Douglas.

Books and Periodicals, &c., Received.

Journal of Meat and Milk Hygiene; Proceedings of the Royal Society of Medicine; Journal of the Royal Army Medical Corps; Bulletin of the Bureau of Sleeping Sickness; Bulletins of the Bureau of Animal Industry; Tropical Agriculturist; Agricultural Journal for the Union of South Africa; Rhodesian Agricultural Journal.

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THE LATE PROFESSOR W. OWEN WILLIAMS, F.R.C.V.S., F.R.S.E.

Twice President of the Royal College of Veterinary Surgeons.

THE

VETERINARY JOURNAL

OCTOBER, 1911.

PROFESSOR W. OWEN WILLIAMS.

We deeply regret to have to record the death, which took place suddenly on Thursday, the 7th ult., of Professor Owen Williams, at the comparatively early age of 51 years. Professor Williams had been suffering from varying degrees of ill-health over a somewhat prolonged period.

William Owen Williams, F.R.C.V.S., F.R.S.E., was a Yorkshireman by birth, having been born in Bradford in 1860. He was quite a young lad when his late father removed from Bradford to Edinburgh to take over the principalship of the Royal (Dick) Veterinary College. After receiving his early education at the Edinburgh Royal High School and Edinburgh University, he entered as a student the New Veterinary College, which was founded by his late father in 1873, qualifying from that institution on April 20, 1881, fully six months before he had attained his majority. He then went to Alfort and studied under Professors Goubaux, Nocard and Trasbot, and in 1879 and 1880 was a pupil with Messrs. Stephenson and Elphick, Newcastle. On his return from Alfort he became assistant to his father, and a few years later Lecturer on Morbid Anatomy, Cattle Pathology and Canine Medicine at the New Veterinary College, Edinburgh. On April 29, 1886, he obtained his Fellowship Diploma of the Royal College of Veterinary Surgeons, and in March, 1897, was elected a Fellow of the Royal Society, Edinburgh. Since 1894 (when first elected) he had been a Member of the Council of the Royal College of Veterinary Surgeons, of which body he was elected President in

1902, being re-elected the following year. During his first term of office in 1901-2, owing greatly to his exertions, the then Secretary of State for War was persuaded to appoint a Committee to inquire into the condition of the Army Veterinary Department, and he was nominated a member of that Committee, travelling from Edinburgh at great inconvenience to himself to attend meetings in London; and during his second year of office as President of the Royal College of Veterinary Surgeons a new warrant for the Army Veterinary Department was brought out. That day was a red-letter one in the life of Professor Williams; he had fought long and well on behalf, not only of the Army Veterinary Corps, but of the profession as a whole.

In January, 1900, at the special request of the War Office, he proceeded to New Orleans to act as veterinary adviser regarding the shipment of horses to South Africa during the Boer War, and as a result of the measures adopted on his advice the average landed in South Africa alive and well was over 97 per cent. Unfortunately he contracted malaria and rheumatism in the unhealthy climate of New Orleans, and had to return to England in such a serious state of health that for some time his life was despaired of.

For a number of years Professor Williams was veterinary officer to the Lowthian and Berwickshire Yeomanry Cavalry, and was also Honorary Veterinary Surgeon to His late Majesty the King as well as to his present Majesty.

He was the author of numerous publications on veterinary medicine, and was for several years editor of the VETERINARY JOURNAL, which position, however, he was compelled to resign owing to pressure of business connected with the removal of the New Veterinary College from Edinburgh to Liverpool.

In spite of many difficulties and obstacles the School was incorporated with the Liverpool University and formally opened on December 13, 1904, by the Right Hon. Walter Long, M.P., then President of the Local Government Board.

Professor Williams married in 1885 Annie Christine, daughter of Mr. John Flint, of Glasgow, by whom he had two sons and a daughter.

Apart from scholastic attainments of a high order and a wide and varied experience of men and affairs, which earned for him a career as brilliant as it was popular in his chosen profession,

the late Professor Williams possessed personal qualities, both intellectual and temperamental, that secured him the friendship of a large circle of friends and acquaintances in various walks of life.

Editorial.

"ANTHRAXIN" AND "ANTHRAXINE."

We publish a letter on page 605 from the Pasteur Vaccine Company, referring to an article in our last issue. The statements in the article were obviously the opinion of Dr. Dawson and based on experiments carried out by him. He explained the method by which his "Anthraxin" was prepared, and there can thus be no doubt as to the substance to which he referred. Obviously we cannot hold ourselves responsible for experiments recorded in our pages, nor for the conclusions based on them. They are recorded as a matter of general information for the benefit of the veterinary profession as a whole and as a part of our policy of giving all sides of a question as it is presented to us.

We are ignorant of the method of preparation of the Pasteur Vaccine Company's "Anthraxine," but it would appear that it is an entirely different preparation from Dr. Dawson's "Anthraxin." Consequently we trust that the publication of Dr. Dawson's results and opinion of the use of "Anthraxin" will in no way interfere with the employment of "Anthraxine," and we trust the latter will afford in general practice the excellent results claimed for it by the Pasteur Vaccine Company. The convenient way in which it is put up in cord form is certainly a very great advantage from many points of view, compared with the liquid preparations.

General Articles.

SOME MEMBERS OF THE ROYAL COLLEGE OF VETERINARY SURGEONS WHO HAVE ACHIEVED NATIONAL DISTINCTION IN COMPARATIVE MEDICINE IN THE UNITED STATES OF AMERICA.

By Dr. ARTHUR HUGHES, Litt.M., Ph.D. (Cornell University), D.V.M. (New York State Veterinary College),

Inspector of Food Supplies, Subsistence Department, United States Army, Chicago: Professor of Dairy Inspection and Milk Hygiene, and sometime Lecturer on Meat Hygiene, Chicago Veterinary College, &c., &c.

The Royal Veterinary College, London, proudly bears the title of "parent of veterinary schools in English-speaking countries." It is just one hundred and twenty years ago since Charles Vial de Saint Bel, the Equerry of Louis XVI of France, then the Principal of the Lyons Academy and Demonstrator of Comparative Anatomy at Montpelier, who, when a refugee from the French Revolution, was chiefly instrumental in founding the first English veterinary school. The torch of veterinary intelligence was carried from France to London, then from London to other points in Great Britain and Ireland, accompanied by the upspringing of new schools. England is indebted to France for the foundation in London of a school whose destiny was to foster many great minds and to be the parent of other veterinary schools, at home and beyond the seas. Nor should it be forgotten that this year of grace, 1911, is the 200th anniversary of the foundation of the Lyons School by Bourgelat. The link is a solid one from Bourgelat to Saint Bel, and from Saint Bel to us at present. The stream of veterinary intelligence has run freely from France to Britain, and from Britain to America.

It is fitting, therefore, at this time, to recognize the services of what is, on last analysis, the Royal College of Veterinary Surgeons, to veterinary learning in the United States of America. Though it would not be correct to miss the point that France has, indirectly, through the astuteness of Saint Bel, in furtherance of the establishment of the Royal College in London, done great things for veterinary medicine in America; still less would it be accurate if we forgot that the great Frenchman, Dr. Liautard, who, by the blessing of God yet lives full of wisdom and honours as of years, was the immediate founder of the first

veterinary college in America. Let it be said, to the glory of the Royal College of Veterinary Surgeons of London, that it gave recognition to the noble work of Liautard by making him an Honorary Fellow. France and England, therefore, have established veterinary learning in the United States, and the scholars of both have fostered it and continue to this day their inspiration, yea, more, their sustenance of it.

The United States of America has been fortunate in the influences which have been brought to bear upon it by the Motherland. At one time it was the fashion to refuse to recognize that English and American history records that English literature, law, politics, social life and social ideals have left streams of influences which have been formative in the United States. The superficial American patriotism of a decade or two ago shut its eyes to the great historic fact of the relation of our literature, law, and governmental opinions to the tree of knowledge and the train of experiences throughout their radiant history of our forbears on the other side of the Atlantic. All this is past and a mutual understanding has been established which is drawing England and America closer year by year. In veterinary medicine, also, but little demonstration is necessary to prove our obligations to Great Britain. Though North America is yet thinly sprinkled with practitioners who have graduated at the Royal College of Veterinary Surgeons of London, these men have always shown their antecedents. In private practice they have been veterinary lights in dark places, and, their training having been ample, indeed, in many instances superior to their competitors, they have been held as estimable professional men to meet and to deal with. The Royal College diploma has been the sesame to success. The training of the Royal College, as shown in its men in private practice, has, unquestionably, had its influence as an indication of the proper training necessary for a fuller success and a better understanding of veterinary problems. Moreover, veterinary education being at a low ebb, at the time members of the Royal College began to come to America, they became favourites for veterinary positions of trust, and they filled them honourably. A river can flow no higher than its source, nor do we expect the product of an institution to be anything less than markedly successful if the veterinary principles engendered and fostered by that

institution are such as to constantly stimulate its members throughout their lives. Can a doctor from the Sorbonne be anything but a scholar? Can he who passes his most impressionable days in an Oxford college, like Christchurch or Balliol, come away without the academic marks on his mind? We must expect, then, that he who has the British veterinary training, wherever that was obtained, and has won his membership in the Royal College, will show in his work his antecedents. Heterogeneous as are the influences which tend to make men, which tend to awaken mental gifts, which start men on a career so that they become extraordinarily successful, of this much we may be sure, that the moulding is done by the educators, by the Gamaliels at whose feet they sat. They say in England that Oxford is famous for the movements for the good of the realm which have started from it; while Cambridge is more celebrated for the numerous remarkable men which it has produced. These are arbitrary distinctions. Men are not made by institutions; yet, without institutions of the highest character, in veterinary medicine at least, not many workers of great value in this field would be found. Like father, like son. As the institution is, so are its men.

I have said that we in the United States were fortunate in the influences which we received from the Motherland, and I have not left it to be inferred that not the least of these influences, in so far as we of the veterinary profession are concerned, has been the shaping of our ideals and the formation of educational standards for us by members of the Royal College of Veterinary Surgeons living in our midst. We have been thrice fortunate in that, from our point of view, some of the best products of British veterinary training saw fit, when they were still very young men, to come to our shores. We count amongst us distinguished names, members of the Royal College of Veterinary Surgeons who have achieved national distinction in comparative medicine in the United States. There are men like James Law, F.R.C.V.S., whose monumental volumes on veterinary medicine, and whose many-sidedness as a veterinary worker, have made him justly famous on both sides of the Atlantic. There is William Haddock Dalrymple, M.R.C.V.S., of whom it may be said that it is a question as to which can more be reckoned in his favour, the number and variety of articles he has

written and speeches made for the improvement of agriculture especially in its veterinary aspects, or the number of honours which have been bestowed upon him in acknowledgment of his services to science. Also Joseph Hughes, M.R.C.V.S., who, with two others, one trained in England, though not a member of the Royal College, the other a graduate of McGill University, Montreal, was the founder of the Pioneer Veterinary College in the agriculturally rich Central West of the United States, and who still, as its President, is revered by thousands of its graduates. There is Albert Hassall, M.R.C.V.S., the scientific expert of the Bureau of Animal Industry, United States Department of Agriculture, whose name has been very frequently bracketed with Dr. Chas. Wardell Stiles, the eminent American zoologist, both men having collaborated on some of the best veterinary zoological work which has been done on the North American continent. Furthermore, there is Austin Peters, M.R.C.V.S., an American by birth but British by veterinary training, who, throughout the proud old State of Massachusetts, and, curiously enough, in the conservative city of Boston, has made veterinary science much more than a name, for he demonstrated its value to the better agriculture of the State, and has for years been esteemed by medical men of all branches and schools, by reason of the value of his services in the application of the principles of this science to the common weal. Finally, there is Alexandre François Liautard, Hon.F.R.C.V.S., the father of veterinary science in America, founder of the first veterinary college on the North American continent, writer of monographs on the science in English and translator of works from the French for our benefit, for years a zealous teacher in New York City, and the instructor of many veterinary leaders of to-day; in his later years an incessantly active journalist residing in Paris, who provides us with the *crême de la crême* of the veterinary journals of Europe; above all, a man of robust amiability who never loses a friend.

Such are some of the distinguished men carrying the mark of the Royal College upon their foreheads, who have helped in one way or another to elevate the veterinary profession in North America. Though in many of the countries of Europe the veterinary profession is hundreds of years old, in some many hundreds of years old, in the United States the profession can hardly be said to have had a life of more

than half a century; for it is not more than fifty years ago since the first veterinary college was founded in the City of New York. Professor W. L. Williams, in this JOURNAL, a year or two ago, found occasion to write of the almost Polar darkness of veterinary education in America, and roundly criticized our backwardness, defending his statements with tabulated statistics, which I daresay few thumbed and less cared about. Criticism, if properly taken, has the effect of a dip in the ocean wave—saline and chilling, it is bracing and strengthening. Professor Williams's articles were good examples of special pleading, and he had some foundation for the facts he presented. But those who remember the articles should also remember that he turned the searchlight on our faults and our limitations alone. As President Theodore Roosevelt said on one occasion: "He turned on the lights, but was not responsible for the conditions which the lights revealed." There is, fortunately, another side to the picture which Professor Williams presented. I refer to the work of the distinguished members of the Royal College of Veterinary Surgeons in America and its effects. Too intense a light on a given aspect of things is faulty. It makes a man negligent of everything except that upon which the intense light is thrown.

As a matter of fact, veterinary education in America, low in grade as it may be on the whole, has progressed rapidly in its few fifty years. No small part of this has been due to the distinguished names of which I am to speak. They have all been educators in one way or another. Results in the veterinary world of America can only with difficulty be traced to the work of an individual leader, as they are indeterminably interwoven with numerous events, all of which have brought about the effects we are accustomed to call veterinary progress. Yet, when a result has been reached, or conditions have been brought about, it is natural to expect that some man or men held the leadership which determined the result or the new conditions. The greatest result of Law's work was the foundation of the New York State Veterinary College at Cornell University, Ithaca, New York, the most scientific veterinary institution in the United States. It will be a lasting monument to his name when all else has perished. Dalrymple, by voice and pen, has been, for well-nigh twenty years, the spokesman for veterinary progress in the State of Louisiana, and his mighty work has been felt

throughout the southern portion of the United States in the awakening of the people to an understanding of the usefulness of veterinary science to their peculiar forms of agriculture. When Joseph Hughes came to the Central West thirty years ago there were no veterinary graduates and no veterinary colleges there. Largely as a result of his work, thousands of able practitioners have been supplied to fill a need for modern veterinarians where they were much desired, namely, among the agricultural people on hundreds of thousands of square miles of fertile land in the Missouri and Mississippi valleys, as well as at distant points. Hassall, as a professor of veterinary zoology in the city of Washington and as an expert in zoology for the United States Department of Agriculture in the capital, has been largely instrumental in diffusing exact information on zoological questions, which has been of service to the whole profession. His name is not the least among a group of American zoologists whose study of parasites amongst domestic animals has revolutionized modern ideas on some of the most perplexing of diseases. The result of the pioneer work of Austin Peters was the appreciation in a State devoted to manufacturing and commercial enterprises of the usefulness of veterinary hygiene and sanitary police to their own betterment, while for many years he was the only veterinarian in the New England States who had charge of live stock sanitary control work. The results of the work of Liautard in the United States are multiple. Opinions will differ upon the question: In what way has Liautard's best work been done? It is as the founder of the first veterinary college, and as the pioneer veterinary journalist that he deserves long remembrance. Whatever veterinary colleges came after that he founded; whatever veterinary journals sprang into being after that he started; to him belongs the praise for priority.

Following these introductory remarks, then, in this article, in which I propose to write of some members of the Royal College of Veterinary Surgeons who have achieved national distinction in comparative medicine in the United States of North America, I shall speak of the life and services to veterinary science of James Law, F.R.C.V.S., William Haddock Dalrymple, M.R.C.V.S., Joseph Hughes, M.R.C.V.S., Albert Hassall, M.R.C.V.S., Austin Peters, M.R.C.V.S., and Alexandre François Liautard, Hon.F.R.C.V.S.

Americans have the reputation in England of being boastful of the riches, the advancement and modernity of their native country. I am in no peril of such a criticism in writing for a British veterinary journal of the successes of their compatriots in this country. We will be very much mistaken if the careers of these remarkable men do not engage the interest of veterinarians throughout the British Empire; nay, more, throughout the English-speaking world wherever the VETERINARY JOURNAL goes. If "one touch of Nature makes the whole world kin," surely the achievements of distinguished veterinarians in the United States will rouse more than a passing interest in the minds of British veterinarians everywhere. Though the human imagination, playing upon biographical material of this kind, tends to idealize upon the actual; though facts passing through the alembic of the mind, when human feelings are intensely aroused, become other than what they were through reverie, we do not intend to stretch the truth nor to stultify it. Sufficient it will be for us if a better understanding is reached, after reading the article, by British veterinarians the world over, of veterinary tendencies in America, and encouragement given the ambitious to equal or excel the subjects of these biographical sketches.

I.—JAMES LAW, F.R.C.V.S.

There has been no more conspicuous figure in the veterinary history of the United States nor in North America, during nearly half-a-century, than Professor James Law. An account of even the salient features of the career of this great man would fill a volume—such a volume as authors delight to write in historical or biographical series like the "English Men of Letters Series," published in England, or the "Makers of the Nation Series," in the United States. His career, indeed, is one of which a facile writer would like to deal as a section of one of such a series of volumes as the famous British publications, the "Dictionary of National Biography," edited by Sir Sidney Lee. There is a great deal of the picturesque in the career of this illustrious veterinarian. Like Goldwin Smith, the celebrated litterateur and Professor of Modern History in the University of Oxford—a man who had had a distinguished record in Great Britain—who came to America in the late 'sixties to help found Cornell University in the State of New York, Professor Law,

PROFESSOR LAW.

who also had had a most remarkable record as a veterinary scholar in Scotland and England, also came over to help promote the interests of his science and agriculture in the same State at the same time, and was made a professor in the same institution. Goldwin Smith and James Law were bracketed together in the new university as equally scholarly importations: but in lines of work which were antipodes, or rather which, in those days, were supposed to be antipodes.

In order to compare the British and American parts of his career, because the latter more particularly concerns us in this article, as a preamble I shall speak of his record before he left his native land.

Professor Law was born in the county of Edinburgh, Scotland, February 13, 1838. Till eight years of age he was educated in private and parish schools of West Calder and Livingston; later in the Burgh High School of Dunbar, East Lothian. At sixteen years of age (1854) he entered Edinburgh Veterinary College, where he studied, among others, under John Barlow, one of the first veterinarians of his day; under Finlay Dun, author of "Veterinary Medicines: Their Actions and Doses"; and John Gamgee, the author of "Domestic Animals in Health and Disease"; "Dairy Stock: Anatomy of the Domestic Animals," by Gamgee and Law, &c., the founder of the *Edinburgh Veterinary Review*. Gamgee might well be named the most brilliant veterinarian of his time. James Law graduated in 1857 in a class of 183, the largest that had ever graduated at his Alma Mater, and which included William Williams and Thomas Strangeways, afterwards well known as teachers and writers. Though the youngest member of the class, Mr. Law was awarded the medal for the best examination in anatomy, and shared with Mr. Williams two medals, awarded as two equals, for the best general examination. He became a M.R.C.V.S. in 1863, and a F.R.C.V.S. in 1870. In the year following his graduation (1858) Mr. Law associated himself with John Gamgee in the Edinburgh (New) Veterinary College, taking the position of Demonstrator of Anatomy. In the same institution he successively filled the position of teacher of materia medica (1860-65), and anatomy (1865-67), when, in 1865, the college was transferred to London, as the Albert Veterinary College. Meanwhile he was active as collaborator

on the *Edinburgh Veterinary Review*, contributor to "Domestic Animals in Health and Disease," as veterinary editor of the *Scottish Farmer*, and as the author of the descriptive part of "Anatomy of the Domesticated Animals."

Thirty years of Professor Law's life were thus passed in Great Britain before his coming to America. These years were fruitful in various forms of educational activity, and he had been mellowed through experience as a college teacher and as a writer. If he had remained in England, by every token he would have been a brilliant veterinary leader, and would have gone on from strength to strength, and from success to success, as every sign indicated. But destiny had something else in store for him. Unlike Cæsar, he did not need to yearn for other worlds to conquer, for a way was made open for him to be of even greater benefit to his fellow men than he would have been had he remained in Great Britain. Thirty years he spent there: the next forty years of his eventful life was spent as a pioneer in veterinary science in the New World.

In 1868 Professor Law was called to the Chair of Veterinary Science in the newly founded Cornell University, Ithaca, New York State, United States of America, which he held until 1896. In 1896 he was named Director of the New York State Veterinary College, which that State that year, or just previously, practically through the efforts of Professor Law, had founded and endowed as one of the colleges of Cornell University, taking special charge of the subjects of Veterinary Medicine, Veterinary Sanitary Science and Parasites and Parasitisms in Domestic Animals, 1896 to 1908. In 1908 he retired on the Carnegie pension, after forty years' service in the University.

During this American part of his career he was veterinary editor for the New York *Tribune*, *Livestock Journal*, and, in more permanent form, produced the "Farmers' Veterinary Adviser," now in its sixteenth edition; "Text Book of Veterinary Medicine," in five volumes, now entering on its third edition; and various contributions to standard medical books on veterinary matters. He was consulting veterinarian to the New York State Agricultural Society (1868-1896); chairman of the United States Treasury Cattle Commission, which had to do with the suppression of Lung Plague or contagious pleuro-pneumonia in the early 'eighties; member of the New York State Commission on Tuber-

culosis in Cattle, 1894; and Field Chief of the Bureau of Animal Industry, United States Department of Agriculture, for the extinction of Lung Plague of Cattle in Illinois and the Eastern States. In 1883 he acted as delegate of the United States Department of Agriculture to the International Veterinary Congress at Brussels, Belgium; and as reporter on the "Veterinary Colleges and Veterinary Education in Europe" at that date. In this connection may also be mentioned his active part as consulting veterinarian for the United States Department of Agriculture in the outbreak of foot-and-mouth disease in New England in 1902, and his active charge, as consulting veterinarian to the State of New York, in the work of extermination of foot-and-mouth disease in that State, 1908-1909.

Professor Law has been a many-sided veterinarian, as is shown in the variety of his productions, and the variety of his other activities, in all of which he has been markedly successful. His works are authoritative writings on veterinary science in the United States, whether they appear in text-books, in medical standard works, in agricultural or veterinary journals, in the documents of the State of New York, or in the United States Reports. As a professor he has trained many of the leading veterinarians of North America, such as Drs. Salmon, Farrington, V. A. Moore, and Pearson. Through his efforts the New York State Veterinary College was founded, which will always be a lasting monument to his memory. In the inauguration of legislation for the improvement of veterinary education, suppression of quackery, the examination for licence, as well as in sanitary police measures, Professor Law's brain and hand have frequently been shown. His work for improvement of industrial activities has taken no small part of his time. For the advancement of agriculture, especially by the information he has dispensed in the simplest, clearest English, for farmers, through his books, pamphlets and speeches, he has gained the reverence of untold thousands and their gratitude. While in private practical work, his skill in diagnosis, the sureness of his anatomical knowledge, the celerity in dosage, the large information he possessed on pathology and hygiene, made him a favourite as a consulting veterinarian. On his personal and social side no more thorough gentleman could be met. The nation, the State, the University he served, his profession, have united

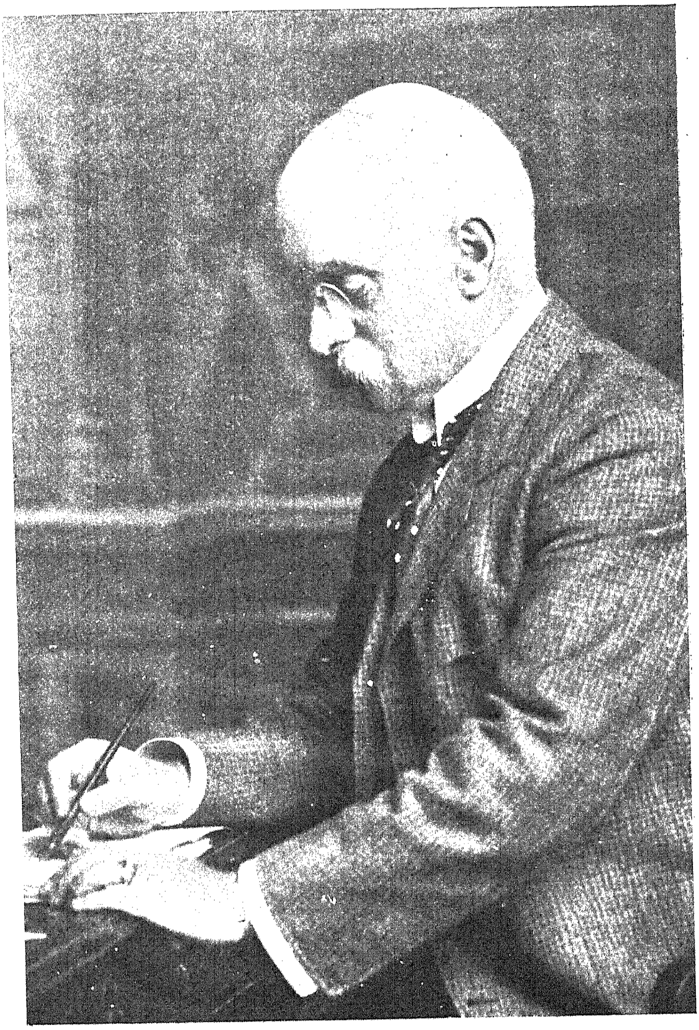
to do him honour, and have taken pleasure in acknowledging his many successes and his unselfish services to his fellow-men.

II.—WILLIAM HADDOCK DALRYMPLE, M.R.C.V.S.

In speaking of William Haddock Dalrymple, we are again dealing with a Scotsman, but not one who, like Law, took up his residence in the North of the United States. Dalrymple has been a Southerner of Southerners. Both men have singularly well adapted themselves to the social strata in which they became domiciled, and both with equal speed soon mastered the agricultural problems associated with their science in the new environment—the one in the temperate climate and among the verdant hills of Central New York; the other in the semi-tropical country along the lower Mississippi River, not far from New Orleans.

A few words on the British portion of Professor Dalrymple's career will form an introduction to the American part of his career. He was born at Stranraer, Wigtownshire, Scotland, April 23, 1856. His preliminary education was obtained at the Stranraer Academy, and his professional training was received at Glasgow Veterinary College. He passed the examinations for M.R.C.V.S. in 1886. That year he went to Dublin and engaged in veterinary work, becoming a member of the veterinary staff of the Irish Privy Council. In 1889 he emigrated to America.

Since coming to America he has held, practically continuously until the present time, the position of Professor of Comparative Medicine in the University of the State of Louisiana, located in the capital, Baton Rouge, and veterinarian of the Louisiana State Experiment Stations, such, we may add by way of explanation, as the United States Government supports in each State for the purpose of scientific investigation in the sciences related to agriculture. But this professoriate, to him, has been no sinecure position. Work confined to university routine was not for him. Men of ambition make their university positions only a means to an end—to enable them to reach out and perform work they see should be done, but which is optional for them to do. Dalrymple, in a letter received several years ago, described himself to be "one of those unfortunate men who always wants to do much more than the next man, and to work a little



W. H. Dalrymple

harder just to make things go." Consequently, this university professor has made himself one of the most useful men to the public and to the science in the State of Louisiana, in the Southern States; indeed one of the most useful and influential veterinarians in the country, a fact which is illustrated in the very large number of agricultural and veterinary offices which he has held or is holding, and by the honours which have been showered upon him.

(Another interesting instalment of this series, with photographs, will be produced in the November issue of the VETERINARY JOURNAL.)

THE EPIZOOTIOLOGY OF ANTHRAX.*

By STEWART STOCKMAN, M.R.C.V.S.

London.

WHEN I was invited to read a paper on anthrax I was very considerately informed that I might choose for my paper whatever features of the disease I preferred to deal with, for it is evident that anthrax in all its features cannot be dealt with in one lecture. I have chosen the epizootiology of anthrax, and, as diagnosis and prevention are most important parts of epizootiology, I have attempted to deal with them as fully as possible.

Diagnosis.

In the cases of cattle and sheep the usual history is that one animal has been found dead or in a moribund condition, and that signs of serious illness had not been observed until shortly before death. Anthrax may or may not be suspected by the owner. Anthrax, however, is not always fatal, and inasmuch as several animals may have contracted the disease from the same source, and be less severely attacked, or in different stages of the disease, it is advisable to make use of such clinical aids to diagnosis as can be applied on the spot to animals in contact. This applies especially to cows in byres, and it has frequently been observed that some of the contacts to an animal which has died of anthrax show a suspiciously high temperature.

In the cases of horses and pigs there are often certain objective symptoms to guide one, such as swelling of the tissues around the throat, and in the former severe colic. These ex-

* Read before the Midland Counties Veterinary Medical Association.

ternal lesions are of great value in connection with diagnosis during life and after death, but, while their presence is strongly indicative of anthrax, their absence cannot be regarded as satisfactory evidence that the disease does not exist.

The irrefutable evidence of the existence of anthrax is the presence of the anthrax bacillus in the body fluids or tissues. The blood is the fluid from which preparations can be most conveniently made for microscopical examination, and, since the bacilli seldom invade the blood-stream in sufficient numbers to be detectable until the animal is practically moribund, a positive diagnosis follows usually upon the finding of anthrax bacilli in the blood after death. It is seldom indeed that the bacilli have not invaded the circulation in large numbers in cattle and sheep just before death, but very occasionally cases of anthrax are met with in these animals in which a microscopical examination of blood from the peripheral vessels fails to reveal the presence of anthrax bacilli, and other methods of diagnosis have to be employed. In pigs and horses it frequently happens that the animals die of anthrax before the bacilli have invaded the circulation in large numbers, and under such circumstances diagnosis by the microscopical examination alone of smears from the blood in the peripheral vessels often fails. It is advisable in horses and pigs to make smears from a gland near the surface and from any œdematous fluid which may be present, as well as from the blood.

Given that these methods of examination have been applied with a negative result, there is nothing left except to seek for the cause of death by an examination of the internal organs, still paying due regard to the possibility of anthrax existing, and taking all reasonable precautions against infective material being disseminated. A great deal of importance is often attached to finding the carcase of an animal tympanitic, with blood oozing from the orifices. Without wishing to minimize the importance of this in arousing suspicion of anthrax, I would like to remark that no conclusion can be drawn from its presence or absence. It may happen that this further examination will tend to increase one's initial suspicions. For example, if enlargement of the spleen be found, with a fluid tar-like appearance of the pulp, or if the intestines and lymph glands are markedly congested, anthrax should always be suspected, and smears for further

microscopical examination should be made from the altered organs.

A fairly common lesion in pigs, and one of great diagnostic value, is the presence of necrotic areas on the mucous membrane of the pharynx. These vary in size, but are commonly as large as a shilling. The centre is dark, almost black in colour, slightly raised, and the edges are level with the mucous membrane. There is seldom any difficulty in finding anthrax bacilli in preparations made from these areas.

In cattle and sheep anthrax may be confused with blackleg. The local lesions of the latter disease are generally sufficient for differential diagnosis, but it must not be forgotten that in sheep dead of blackleg lesions of the skeletal muscles may be very slight, or even absent. It is sometimes stated that the bacillus of blackleg does not invade the blood-stream. This, however, is an error, and the finding in almost pure culture of an appreciable number of bacilli like those of blackleg in preparations made from the blood is almost sufficient evidence to exclude anthrax. In the horse one may be misled during the life of the animal by the belief that it is suffering from serious intestinal trouble. In dealing with the carcase of an animal, however, it is unnecessary to attach a great deal of importance to differentiating finely between the macroscopic lesions of anthrax and other diseases, because, if the circumstances or lesions are such as to make one suspect anthrax, the question can be decided by establishing the presence or absence of a definitely ascertained microbe; these things are happily no longer the matters of opinion which men of the more ancient clinical school found time to wrangle about.

We have next to consider the methods of establishing the presence of anthrax bacilli in fluids and tissues, and microscopical examination naturally comes first for consideration. I take it, it may be assumed that everybody knows what is meant by a smear, that smears should be made from blood present in the peripheral vessels, such as those at the base of the ear, that they should not be made from blood found oozing from the orifices, that in the cases of the horse and pig it is highly advisable also to make smears from a superficially placed lymphatic gland, and that for bacteriological examination an oil immersion lens is indispensable. The smears are fixed by heating the glass slides

over a flame, after the fluid has been dried. Amongst the specimens sent to the laboratory purporting to contain anthrax bacilli a few have been unstained cover-glass smears of blood mounted in balsam, and I have known members of our profession who claimed that they had no difficulty in identifying anthrax bacilli in unstained preparations. This, however, is rapidly becoming a lost art, and one of the penalties we have had to pay for the advance of civilization is that we must now stain our anthrax preparations. The anthrax bacillus is not difficult to colour with any of the bacterial stains, nor is it difficult to identify whatever be the stain employed, provided the material for the smear has been obtained very soon after the death of the animal and the organisms are fairly numerous. The classical description of the anthrax bacillus in preparations from the blood is: A rod-shaped organism measuring 5 to 8 microns by about 1 to 2 microns, ends square cut, or showing cup-shaped depressions, consisting of a central rod of protoplasm bounded by a translucent capsule, occurring singly, or in twos or threes joined end to end, but not as long filaments. To see anything very closely resembling the above picture, one must examine perfectly fresh material taken soon after the animal's death. If one expects always to find it in preparations made under the conditions obtaining in the field of practice, the expectation will not be realized. The veterinary inspector frequently does not arrive on the scene until twenty-four or thirty-six hours, or even more, after the animal has died, and it is common knowledge that in this time even the blood in the peripheral vessels may become grossly contaminated by the organisms of putrefaction, especially during hot weather. These organisms, as it were, crowd out the anthrax bacilli, and as some of them, particularly the bacilli of malignant œdema, bear a certain resemblance to anthrax bacilli, the problem of identification becomes more complicated. Further, it is also well known that anthrax bacilli contained in blood, especially under the anaerobic conditions obtaining in the blood-vessels of an unopened carcase, undergo degenerative changes, and disappear in a variable time. These changes give rise to distorted forms, which, up to a certain point, may aid identification, and beyond that make it more difficult. The central protoplasm may be twisted, shrivelled, and very granular, but the most marked changes are probably observed in connection with the capsules,

which may swell up to several times their original size, and assume curious shapes; they may also rupture. Sometimes the protoplasm inside the swollen envelope takes the stain very feebly, giving rise to what may be referred to as ghost forms. In preparations made from tissue which has been exposed to the air for some little time one may also see anthrax threads of considerable length, made up of bacilli of about equal length joined end to end, and there may even be sporulating forms in warm weather. In the majority of cases, however, the long forms seen in preparations are not anthrax filaments; they are threads of the malignant œdema bacillus, made up of rods of very unequal length, and of greater thickness than those of anthrax when stained in certain ways. Other filaments of bacilli more or less resembling anthrax may also be present when the material has become grossly contaminated.

I have purposely said nothing about motility as an aid to differentiating between anthrax and other micro-organisms, as I consider the manipulations necessary to put it in evidence are too dangerous to be made use of by practitioners. The anthrax bacillus is not motile.

Two methods of staining are particularly helpful in the identification of anthrax bacilli, while certain others should be avoided. First, we may take Gram's method. This is not a good method for staining the anthrax bacillus, as it usually shrivels the protoplasm, renders it very granular, and causes a certain amount of distortion, which may make identification somewhat difficult in certain preparations. On the other hand, it may be usefully employed, when necessary, to distinguish between the anthrax bacillus which is Gram-fast and other somewhat similar microbes which are not—malignant œdema, for example. The most misleading stain of all is gentian violet, which is apt to colour the envelope of the anthrax bacillus, giving the rod an unnaturally thick appearance. This increases the difficulty of distinguishing between it and certain other microbes. The now well known methylene-blue method of staining has the highest diagnostic value of all. As everyone knows, this, as a valuable aid to the identification of anthrax bacilli in preparations made from the blood, was first described by Sir John M'Fadyean. It consists in staining the smears in a 1 per cent. watery solution of methylene blue, and an essential point in the technique is that

the smears must be only lightly fixed. The protoplasmic rod stains blue without undergoing distortion, and the capsule, particularly if it has become swollen, takes on a rose-pink colour. Sometimes the material of the capsule becomes massed, and appears in the preparations as small pink islands; at other times the field of the microscope has a pink, peppery appearance. Even after all the rods have disappeared, one can often find pink masses in a blood-smear.

In my annual report for 1905 certain observations on guinea-pigs dead of anthrax were described, in which the pink reaction was obtained eighty-six hours after death, but was not obtainable 126 hours after death, when the body had been opened; and in another guinea-pig, which had not been opened, a very distinct reaction was obtained in preparations made from the spleen ninety-six hours after death. Since then I have obtained it from scrapings of dried blood from a shed in which the carcase of a cow dead of anthrax had been dressed about a month previously, and I have also obtained it from the spleen of a cow which was exhumed three weeks after death. I do not, however, mean to assert that one can count upon obtaining it at these long intervals after death.

The other aids to diagnosis which one may employ are cultural examination and inoculation. These are methods for the laboratory, but, inasmuch as the laboratory has to depend on the practitioner for material, you will probably desire that I should say something about these methods, and how material should be collected for transmission. When the microscope fails to reveal the presence of anthrax bacilli, or when the material is so grossly contaminated with other microbes that identification of the anthrax bacillus is difficult, inoculation or cultural examination may be resorted to, and it ought to be made use of if the history of the case is suspicious. For inoculation guinea-pigs or white mice are usually employed, and one is almost always restricted to the scarification method in order to avoid killing the animals from malignant œdema. Material which is grossly contaminated, or which contains very few anthrax bacilli, sometimes fails to infect by the scarification method, and on this account it seems probable that the cultural method is the more reliable, because the contaminations can be got rid of, and there is no reason to believe that one or two bacilli or spores are not sufficient to

start a culture, although they may fail to fatally infect an animal. Agar slopes are inoculated with material from a swab, and placed in the incubator overnight to give any anthrax bacilli which may be present the chance to sporulate. The culture tubes, or material therefrom, are heated in a water bath at 80° C. for half an hour. This kills all the non-sporulating bacteria, which are the majority, and by making cultures on agar slopes from the heated material it is possible to obtain relatively pure or even pure cultures of the anthrax bacillus in a matter of hours. Needless to say, the material sent to the laboratory should be collected as purely as possible.

What is now known as the Strassburg method of collecting material has been strongly recommended by many authorities. In this method pieces of gypsum are soaked in broth, which fills the pores, and they are afterwards sterilized in test tubes and sent out to inspectors. The gypsum is dipped in the suspected material and returned to the laboratory. The theory underlying this method is, that the anthrax bacillus finds the conditions for sporulation in the pores of the gypsum, assuming the temperature to be favourable, and may even have sporulated by the time the material reaches the laboratory. Under the conditions prevailing in Great Britain, however, the simpler method of sending to the laboratory smears and a swab of sterile cotton-wool which has been soaked in the suspected material meets the case. This is the method in use by the Board of Agriculture, and I have brought with me an apparatus which has been designed for collecting and transmitting material.

Members of this association will probably be surprised to learn that at this late date in the history of a profession which may justly claim to be a scientific profession there are still men in the position of veterinary inspectors to local authorities who are so forgetful of their responsibilities as to send by post, in cigar boxes and other leaky vessels, portions of spleen and other tissues from animals suspected of having died of anthrax. Apart from the moral obligation involved, I think you will agree with me that it would not advance the prestige of the veterinary profession if any one of its members had to answer a charge of contravening the Post Office regulations in a matter of this kind, or if he were charged with the more serious offence of culpable homicide.

Epizootiology.

The most important factors admitted or suggested to explain the upkeep and dissemination of anthrax are as follows:—

First.—The disease is not disseminated to any important extent by the infected animal during life, but it may arise from a patch of infection established by a previous case on a pasture. It is well known that anthrax bacilli may sporulate under certain conditions, and that the spores are very tenacious of life; in the laboratory they may remain infective for several years. One does not know definitely, however, to what extent spore formation may occur in blood, &c., deposited on the pastures under the climatic conditions obtaining in Great Britain, and it must be

TABLE I.

Showing Total Outbreaks for Five Years—1902-1906—in six of the Worst Infected Counties in Great Britain, together with the Number and Proportion of Outbreaks on New and Previously Infected Farms.

County	Total outbreaks	Number on new farms	Percentage of total Per cent.	Number on previously infected farms	Percentage of total Per cent.
Aberdeen	500	400	80	100	20
Somerset	143	119	83	24	16
Salop	125	112	89	13	10
Wilts	78	67	80	11	19
Cheshire	218	191	87	27	12
Total	1,064	889	83.5	175	16.5

remembered that for several years past it has been customary to avoid the spilling of blood from animals dead of anthrax. Nor is it known how long the spores of anthrax, granted their formation, may remain capable of infecting after their arrival on the pastures. The available evidence is totally opposed to the view that anthrax arises mainly, or even to a great extent, from previous cases on the same establishment. If it did, one might fairly expect to find the disease frequently repeating itself on the same establishments in the same year and from year to year. This does not happen in Great Britain. The information summarized in Table I from the official records clearly shows that the vast majority of outbreaks (average 83.5 per cent.) occur on farms which have not been previously infected, and it is to be noted that it does not necessarily follow that in the remainder

(16.5 per cent.) infection arose from virulent material on the pastures, or from a previous case on the same establishment.

By going through the records in the above counties of the 993 farms infected for the first time during the ten years from 1895-1904, I found that anthrax had occurred more than once during that period on 120 farms, that is, on only 12 per cent. of the total.

With regard to the proportion of farms on which anthrax occurred more than once in any one year, the records over a period of twelve years (1895-1906) for the above counties were examined. There were infected for the first time during that period 1,388 farms, and anthrax occurred more than once in any one year on only fifty of them (4.6 per cent.). These figures were published in my Annual Reports for 1905 and 1906, and since then the records for all the other counties of Great Britain have been examined with practically the same result. In considering the importance of ground infection one must also weigh the fact that although there have been over 500 outbreaks a year in Great Britain for many years, which must have infected an enormous number of premises, the disease has certainly not increased in proportion, and only a small minority occur on previously infected farms.

Table II shows the quarterly incidence of anthrax from 1906-10. It will be observed that there is a marked and constant drop in the number of outbreaks in the third quarter of each year, that is to say, at the time when most stock are on grass, and that there is a decided rise when the animals may be assumed to be running in, and receiving artificial food.

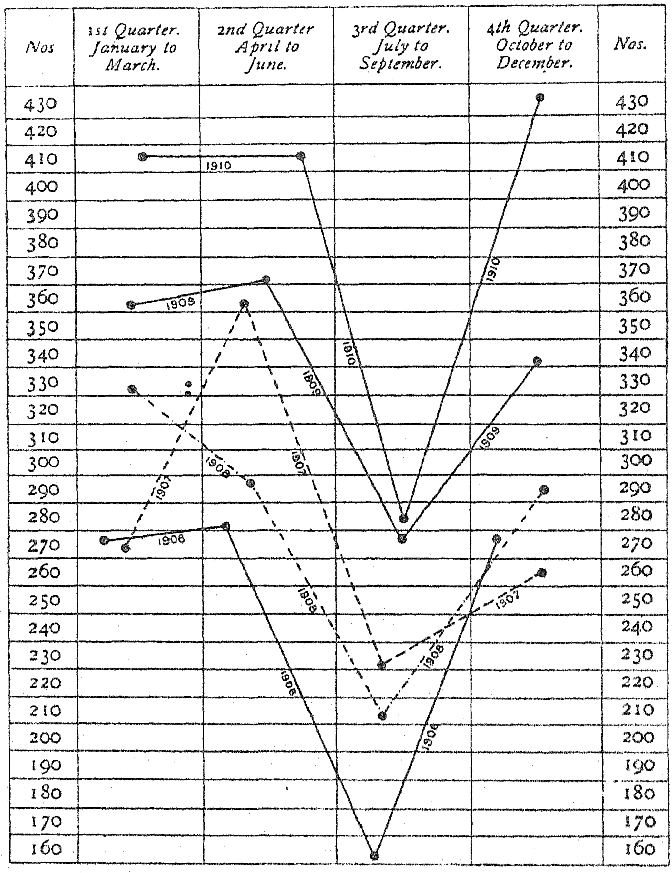
Second.—It is suggested that the disease is carried by flies.

Many are familiar with the sight of flies feeding on the blood of a carcase which has been opened, and one of the oldest suggestions in relation to infection in the case of anthrax is that it may be carried by flies. In a recent report to the Local Government Board, Dr. Graham-Smith showed that living anthrax bacilli could be recovered from the material which flies regurgitate after feeding, and from their fæces, provided they had fed on anthrax bacilli. Cultures were obtained from the fæces forty-eight hours, and from the crop five days, after feeding. After feeding on spores cultures were obtained up to the twentieth day. This, of course, is not surprising, as we know

the spores may live for years. These observations convey the suggestion that flies in the above way disseminate anthrax. I think one must admit that flies could carry infection, but, interesting as Graham-Smith's observations undoubtedly are, there

TABLE II.

Quarterly Incidence of Anthrax in Great Britain, 1906-1910.



is no important gap in the epizootiology of anthrax which his observations can fill. Further, we have every year a certain number of cases in which men contract anthrax from dressing infected carcases. When this happens it is not those helping, on whom flies may, and do, alight, who contract the disease,

but almost invariably it is the man who does the actual cutting, and who has sores on his hands and arms, which come in contact with the blood. Moreover, it is quite obvious from Table II that the number of outbreaks in cattle drops very decidedly during the season in which flies are prevalent.

Third.—Infection may be carried by contaminated feeding stuffs brought in from without, particularly by material brought in from countries where anthrax is very prevalent.

The facts brought out in Table I are strongly in favour of the view that the great majority of outbreaks in this country are due to infection from without. Table III summarizes the information collected in connection with 1,257 outbreaks of anthrax on previously clean farms, where ground infection could not have operated. It is to be observed that only those cases in which the diagnosis was beyond question have been taken, and that special inquiries were instituted into the correctness of the history of the premises.

Evidence that foodstuffs carry infection is very difficult to obtain under the conditions of experimentation, one reason being that the infected portions have probably been consumed by the dead animal before samples were taken. During the last few years samples of feeding stuffs upon which suspicion rested have been experimentally examined at the Board's laboratory with negative results. Both Sir John M'Fadyean and Mr. Dunstan, M.R.C.V.S., however, have demonstrated experimentally that cake may contain the spores of anthrax, and the former has isolated the anthrax bacillus from imported oats. These positive results, few as they are, are of the highest importance to the question under discussion, when one considers how enormous are the chances against obtaining them with the small samples it is possible to examine experimentally.

One has next to inquire how feeding stuffs may become contaminated. In the process of manufacture the material from which cake is made is heated to a temperature considerably below the boiling point of water (180° to 200° F.), which is, of course, insufficient to destroy the spores of anthrax. Compound cakes are pressed between metal plates, but the seed from which the other cakes are made is pressed in cloth bags, made from refuse wool and horse hair, to extract the oil. On the assumption that the material used in the manufacture of bagging might

infect the cake (shoddy wool and horse hair are frequently infective), about a hundred different samples were examined experimentally at the Board's laboratory, but with negative results. Personally, although I cannot free my mind from the suspicion that bagging may infect cake, I think the most likely explanation of infection is that the grain or meal in course of transit from countries badly infected with anthrax becomes contaminated by infective material from dry hides, which, on account of their light weight, are often stowed on the top of other cargo. I have known a number of outbreaks follow the distribution of a consignment of Soya beans in a part of the country where previously

TABLE III.

Showing Results of Special Inquiries into Cases of Anthrax reported from Farms said to be Infected for the First Time (1905, 1906, 1907, 1908, 1909).

Total cases inquired into, 2,527. Deduct 1,270 cases in which the diagnosis could not be confirmed = 1,257.

Confirmed Cases. Total	Number of those which on further inquiry might have been due to a former case (*i.e.*, a death under suspicious circumstances was known to have taken place) (14 per cent.)	Number of those in which no former history of anthrax could be obtained after careful inquiry (83 per cent.)	Number of those in which after careful elimination of other causes the evidence pointed to artificial feeding stuffs or manures (68 per cent.)	Number of those in which there was no history of former outbreaks nor of artificial feeding stuffs nor manures (20 per cent.)
1,257 ...	179 ...	1,046 ...	860 ...	254

anthrax was almost unknown. It should also be noted that there is a possibility of cake being contaminated by infected material after it leaves the factory.

Fourth.—Infection may be disseminated by bone manure, shoddy manure, and refuse from tanneries, which may be put on the land or allowed to contaminate the water supply.

There is no doubt that the disease is exceptionally prevalent in certain districts where imported hides are tanned and wool is washed, the assumed explanation being that the drinking water becomes contaminated by the sewage from the factories.

In the course of inquiry it has also been found that the disease is exceptionally prevalent on certain sewage farms which are known to receive tannery and knackery drainage. With regard to bone manure, I have not obtained evidence that a large number of outbreaks can be accounted for in this way, and it should be noted that most of the bone manure used in this country has been heated, or submitted to a chemical process amounting to disinfection, before it is used on the land. There are outbreaks, however, in which the circumstantial evidence indicates that infection has been introduced with turnips which have been grown on land manured with crushed bones. Given infected particles of bone in the soil, one can imagine that roots with the earth adherent might be infective.

Preventive Measures.

In discussing preventive measures in relation to anthrax, I would like to take further advantage of the liberty you have accorded to me of limiting discussion on my part to certain features, for it would not be possible to deal with every side of this question without prolonging the paper beyond reasonable bounds, and I feel I have already overstepped the limits of your patience. I would like to restrict myself to preventive and curative inoculation, as the part of the subject which is of more direct interest to practitioners.

The Pasteur method of preventive inoculation has rendered great service in preserving stock on badly infected farms in various parts of the world. The method consists in injecting the animals with fixed doses of attenuated cultures of the *Bacillus anthracis*. Two injections at intervals of twelve days are performed. For the first injection a very attenuated culture is used (first vaccine), and for the second a less attenuated culture (second vaccine) is employed. Immunity is established about twelve to fifteen days after the second vaccine has been injected. It lasts in cattle about a year, and should be repeated after this period. The great majority of cattle operated on show little more than a temporary indisposition with passing fever after the injection, which may be assumed to indicate a slight attack of anthrax. Occasionally, however, an inoculated animal may die of the disease as the result of the injection, and for this reason the animals undergoing the process of immunization should be

kept in a special paddock, or, better still, in sheds which can be disinfected in the event of an accident taking place. In sheep, accidents are more frequent. The operation should only be attempted by skilled persons, who will know the best way to prevent accidents, and adopt measures to limit their consequences should they occur.

Since the operation is not altogether unattended by the possibility of loss, and since it incurs a certain amount of expense, one has to consider under what circumstances it will be worth while undertaking it. It will be obvious from the first that on farms registering only one death annually it will hardly be called for, and that it would be folly to adopt it on clean farms.

It results from observations on several millions of cattle in various parts of the world that accidents occur in about .5 per cent. of the inoculated taken all round, and that the operation may be expected to reduce the death-rate from anthrax on infected farms to about 1 per cent. or slightly under.

If accidents threaten to occur from the inoculation, they can be avoided to a large extent by giving a dose of anti-anthrax serum. This serum is useful both as a preventive and as a curative agent under certain circumstances. The immunity following upon an injection of serum is, of course, quite temporary, but it lasts long enough to tide the animals over certain risks. For example, if an animal has died of anthrax amongst other animals and its blood has been spilt, it is advisable to inject the others with serum, and remove them from the infected place if possible. If it is not possible to remove them, it is even more desirable to give each a dose of serum to protect them while disinfection is being carried out. The immunity from serum lasts about ten days. When a case of anthrax has occurred, from infection by cake or from preventive inoculation with virus for example, and any of the animals in contact show an abnormally high temperature, a dose of serum should be injected. Unless an animal has been very heavily infected, which does not frequently happen in practice, the infection remains local for a long enough period to enable serum to act.

The chances are very much in favour of saving the life of the animal by the use of serum, provided the blood-stream is not yet invaded by the bacilli. Once the blood-stream is invaded, serum is likely to fail.

ANTHRAXIN AND ANTHRAXINE.

To the Editor of the VETERINARY JOURNAL.

DEAR SIR,—We notice in your issue of the VETERINARY JOURNAL of September, 1911, a reprint of an article entitled "Anthrax, with Special Reference to the Production of Immunity," by C. F. Dawson, M.D., D.V.S., the original article having appeared in the "Bulletin 137, Bureau of Animal Industry." On p. 531 we notice a paragraph referring to a product called "Anthraxin" (spelt without "e" at the end), which, by the way, seems to have given no immunizing results against anthrax, according to Mr. Dawson's opinion. We beg to call your kind attention to the fact that our Company prepares a vaccine against anthrax which is called "Anthraxine" (spelt with "e" at the end), and which has been on the market for several years past, is presented in cord form, similar to our "Blacklegine" (vaccine against blackleg), and are happy to state that everywhere our "Anthraxine" has been used it has always given the best results, and has successfully stood all the trials and experiments made with it by most eminent bacteriologists and several institutes who have recognized its real value and efficiency.

We beg to enclose herewith a circular for our "Anthraxine," and in order to avoid a regrettable confusion (for us) in the minds of the veterinarian public and your readers in general, we would certainly be greatly obliged if you will insert in your next issue, stating that the "Anthraxin" referred to by Mr. Dawson has nothing to do with our anthrax vaccine in cord form, called "Anthraxine," and prepared by the Pasteur Vaccine Company, Limited, a note to offset and clear that paragraph of Mr. Dawson's article in your September issue. A copy or two of your issue containing that rectification will be cheerfully received and promptly sent their price to you.

Yours very faithfully,

H. DEPERDUSSIN.

Secretary of the Pasteur Vaccine Company, Limited, for Paris.

THE SURGICAL RELIEF OF ROARING.*

BY W. L. WILLIAMS, V.S.,

Professor of Veterinary Surgery, Cornell University, New York.

FIVE years ago I presented a communication [13] to this association upon a proposed operation for the relief of roaring in horses, which was discussed by four members, the most enthusiastic of whom was Prof. Merillat, who remarked: "The fewer cases we meet of this kind (roaring), and the less we see

* A paper read before the American Veterinary Association at Toronto, August 24, 1911.

of them afterwards, the better. I like to do a roarer operation as many miles away from home as possible."

The following year I presented a second communication [14] on the subject before this body, and but two members entered into the discussion, though Merillat had developed more courage and was not so unwilling to operate near home.

When Prof. Merillat requested a third communication upon this topic, two strong reasons for consenting presented themselves:—

(1) The two preceding communications might be called prophecies of things hoped for, while the third could be a relation of achievements.

(2) It then seemed probable, which has later been happily realized, that the third communication would be strengthened by the presence and participation of Mr. F. Hobday, F.R.C.V.S., of London, through whose initiative, and against much prejudice, the operation was introduced into Great Britain in 1909, and who, in the brief intervening time, has operated with brilliant success upon a greater number of roarers than any other veterinarian in the history of the profession.

The past five years have been crowded full of interesting developments in this operation. It has had its triumphs and defeats, its encouragements and its obstacles. It has been bitterly assailed and enthusiastically championed, has been looked upon with hope, despair, incredulity, doubt and disrespect. Yet, amidst all these rapid changes and numerous distractions, the operation has moved steadily forwards, and stands to-day securely fixed as a highly valuable surgical procedure.

The history of the growth of the operation for roaring is long, but not voluminous.

The investigations finally leading up to the present operation were begun in 1834, seventy-seven years ago, by the Professors F. and K. Gunther, father and son, Professors of Surgery in the Hanover Veterinary School.

In the first publication by K. Gunther in 1866 [4], he briefly recounted the experiments made by his father and himself, in which six plans were tested, all concerned with the vocal apparatus, the arytænoid cartilages, vocal cords and laryngeal ventricles. Briefly, they removed the vocal cords on both sides, the vocal cords and inner ventricular wall on the diseased side

only, partially excised the left arytænoid cartilage, performed complete arytænectomy, and excised the mucosa of the left ventricle. The five first each had for its object the removal by excision of the obstructing tissues, while the sixth plan had for its aim the causing of adhesion of the vocal cords and arytænoid cartilage to the inner face of the thyroid cartilage.

In 1893 K. Gunther [5] published a special monograph upon the subject, and in 1896 [6] a second edition of this work. During sixty-two years the Professors Gunther pursued their investigations, apparently wholly upon experimental animals without ever operating clinically upon a patient or advising their students or others to operate.

In each edition of the above-cited monograph, K. Gunther asserts that at that date no reliable surgical relief for roaring was known, and advised tracheotomy as the most satisfactory method of handling the disease. In the meantime Cadiot [1], Fleming [3], Hoffman [9], Moeller [10], Vennerholm [11], and others had joined in the task, all devoting themselves to the problem of securing a more reliable technique for arytænectomy, each having a degree of success upon which high hopes were built, but slowly the zeal of each abated, until, when my first communication was presented five years ago, the words above quoted from Merillat were about as optimistic as could be heard anywhere in the veterinary world.

In this country, Butler, Harger, myself and others tried to follow the technique of Fleming or Moeller, and later McKillip and Merillat attempted to bring about adhesions or contractions of the vocal cords in a manner to hold the arytænoid cartilage and vocal cords out of the lumen of the larynx. Such, briefly, had been the history of the attempts at the surgical relief of roaring.

In my first communication, the operation consisted of three separate procedures:—

(1) I performed tracheotomy as a preparatory operation.

(2) Laryngotomy was performed by incising, on the median line, the cricothyroidean ligament, the cricoid cartilage and the crico-tracheal ligament.

(3) The mucosa from the laryngeal ventricle was removed along with the vocal cords and the underlying thyro-arytænoideus muscles.

Neither the preparatory, the invading, nor the basic operation was wholly satisfactory.

The preparatory operation, tracheotomy, now and then did its baleful work of inducing chondritis and tracheal stenosis, as occurred in one valuable animal upon which I operated at our clinic in New Haven. In 1907, upon the presentation of the second communication, Merillat unsparingly criticized this operation as needless and dangerous, and experience has proved his criticism eminently correct.

The laryngotomy was quite as unsatisfactory. The severed cricoid suffered from chondritis, and laryngeal stenosis ensued.

It was then decided to try severing the thyroid cartilage instead of the cricoid, but that was at best no improvement, and this part of the operation remained unsatisfactory and the results were all too often disastrous.

I was about to return to the severing of the cricoid cartilage as safer, when, in October, 1909, I discovered that one could readily operate through the crico-thyroid ligament alone, without wounding either adjacent cartilage. Soon thereafter I had a communication from Professor Cary [2] stating that he had been performing a similar operation through the crico-thyroidean ligament for some months before I had believed it practicable.

Having demonstrated the operation to Mr. Hobday in London in 1909, as soon as convinced of the practicability of operating through the crico-thyroidean ligament alone, the fact was communicated to him. He had already been independently working to the same end, and in his first publication upon the subject Hobday [7], by reference to my letter, was the first to publicly announce this final improvement in the technique of the laryngotomy.

The basic operation itself has undergone important evolution. At first the ventricular mucosa was removed along with the vocal cords, and the underlying thyro-arytænoideus cartilage, by which the arytænoid, robbed too largely of its attachments, fell down into the cricoid ring, adhered there, and partially occluded the air passage, causing a type of roaring. Then began a gradual contraction of the operative area, first removing, in addition to the ventricular mucosa, only the mucosa covering the vocal cords, and preserving the cords themselves, along with the thyro-arytænoideus muscles lying beneath. That idea was

not very practical. The vocal cords and thyro-arytænoideus muscles were badly wasted, were devoid of contractile power, and were worth but little as a stay for the angle of the arytænoid cartilage, so that experience gradually led to a restriction of the basic operation to the ventricular mucosa, leaving the vocal cords intact.

Naturally, as well as fortunately, each individual operator varies the details of technique somewhat, according to his personal views, but fundamentally there is agreement. The technique as at present followed by the writer is as follows: —

The horse is cast or secured upon the operating table in the lateral position, anæsthetized, turned upon his back, a running noose placed upon the lower jaw, the halter or other headgear removed, the head completely extended upon the neck by drawing upon the cord on the lower jaw, and the operative area shaved and disinfected.

An incision about 6 in. to 8 in. long is then made on the median line with a scalpel, beginning over the body of the thyroid cartilage and extending beyond the cricoid cartilage, severing the skin and the sterno-thyro-hyoideus muscles. Care should be taken to keep the incision as accurately on the median line as possible in order to limit the hæmorrhage to the minimum. This incision completed, the thyroid cartilage, the crico-thyroid ligament and the cricoid cartilage are brought clearly in view.

After controlling the hæmorrhage from the cutaneo-muscular wound, a longitudinal incision is to be made through the crico-thyroidean ligament. This incision needs be accurately on the median line, lest the scalpel pass behind the artænoid cartilage, between it and the thyroid, resulting in a division of the artænoid attachments, with unnecessary and probably injurious mutilation. It is safer to begin the incision by placing the back of the scalpel against the anterior border of the cricoid cartilage, with the scalpel point directed somewhat backwards, towards the chest, pushing it through the membrane and then extending the incision forward to the thyroid cartilage.

The wound thus made is next to be dilated to its maximum and held open by means of self-retaining retractors, such as the appendicitis speculum of Mayo. Any blood which may trickle into the larynx should be carefully wiped away by means of pledgets of absorbent cotton or sterile gauze held with a long

pair of forceps, such as human uterine dressing. Since any blood in the larynx, by absorbing light rays, interferes seriously with the illumination of the operating field, it is highly important for accuracy in operating that the hæmorrhage be carefully controlled and all blood kept out of the way. Adequate illumination of the larynx is highly essential. It is most uniformly and reliably secured in a moderately lighted or even dark room, with a reflecting electric lamp on an extension cord. Illumination may also be had with the dry cell pocket electric lamps, though in such cases it is best to have a second lamp in reserve should one fail to work.

In a well-lighted room, good illumination may be had if the horse is secured with his head away from the window or door, so that the rays of light may enter obliquely from behind and above, forwards and downwards. If the position of the horse is reversed so that the light rays enter the larynx obliquely from above downwards and backwards, the seat of operation is thrown into shadow, with a troublesome illumination more posteriorly.

If the weather permits of an operation out-of-doors, good illumination is practicable, except that the operator needs be careful to secure the animal with its head away from the sun, so that the rays of light will enter the larynx obliquely from above and behind in the manner already described. Otherwise the glare of the sun in the operator's eyes and the shadow cast upon the site of operation combined renders accurate vision impossible.

The basic operation consists in grasping the ventricular mucosa at its border with a pair of curved uterine dressing (or other similar) forceps, capable of taking an especially secure hold at the end. I habitually grasp the mucosa first along the anterior border of the ventricle close against the inferior border of the arytænoid cartilage, and then, with the razor-shaped scalpel, incise the mucosa near to and parallel with the margin of the ventricle, and extend this incision in both directions from the engaged point, along the border of the ventricular opening, until finally the two incisions meet and the ventricular mucosa is isolated from the general mucosa of the larynx.

I have found it convenient, after the incision through the mucous membrane has been begun, to draw gently upon it with the forceps, with which it was grasped at first, lifting it upwards in such a manner that another section of the mucosa may be

readily grasped with a second pair of forceps, then by alternating between the two pairs of forceps the mucosa at the margin of the ventricle may be lifted up section by section and held tense while the incision is made.

When the incision through the mucous membrane has extended until the entire ventricular opening has been surrounded, the isolated portion is to be detached and removed by exerting gentle traction upon the incised edges, while, with the razor-shaped scalpel, the membrane is carefully separated from the underlying tissue. In this process, the operator is to remember that the ventricle extends obliquely downward behind the vocal cords and towards the crico-arytænoid articulation, and that the scalpel should be so directed as to avoid puncturing and mutilating the ventricular mucous membrane. When the ventricular mucous membrane comes away, the operator should draw it over the end of his finger to see that it forms a complete sac, in which case he knows that the operation is perfect. If the mucous sac is mutilated, the operator needs search the ventricle carefully and remove any patches of mucosa which may have been left behind.

Any blood is then to be carefully wiped away from the operation field and the larynx, the parts disinfected, and the patient allowed to get up.

The wound inevitably becomes infected, and should accordingly be left entirely open to permit of the free exit of wound secretions. Soon after the patient has regained his feet, and the very slight hæmorrhage has ceased, the laryngeal and ventricular wounds should again be carefully disinfected. Using the long dressing forceps, the ventricular wound may be well disinfected by using a small pledget of cotton saturated with the disinfecting liquid. The disinfection of the cutaneo-muscular wound should be repeated twice daily for three or four days, and then once daily till healed.

The horse should be kept under close watch for the first twenty-four to forty-eight hours of possible dyspnœa, especially in cases of the bilaterial operation. Severe and even fatal dyspnœa may arise as a result of blood coagula in the denuded ventricle, œdema, or emphysema of the ventricular connective tissue, &c.

The dyspnœa may be overcome in a variety of ways. Tracheotomy may be performed, but only with the usual dangers from

chondritis and tracheal stenosis. In many cases a strong suture applied to the margin of the laryngeal wound, each suture passing through the crico-thyroidean ligament and the muscle and skin, and then tied tightly over the back of the neck, may serve to open the incision and permit the entrance of air in many cases. The best and safest method is the application, through the existing wound, of a simple laryngeal tube with tapes to tie over the neck, additional security being given by inserting a strong suture in either side of the wound and tying the laryngeal tube securely to them. The tube should be flattened laterally and merely large enough to furnish breathing room with the animal at rest. The tube should be omitted as promptly as is safe. The healing of the wounds requires for completion about twenty days, and the patient is then ready for moderate exercise, which may be gradually increased to full work in six to eight weeks.

Briefly, the operation as described has as its basis the procuring of a firm and permanent adhesion to the thyroid cartilage of the left arytænoid cartilage and vocal cord, and, in cases of bilateral disease, also of the right cartilage and cord, through the obliteration of the laryngeal ventricle, without involving any injury to a cartilage in any part of the operation.

The operation is surrounded by the customary dangers of confinement, chloroform syncope, chloroform pneumonia, and wound sepsis.

While the operation is not difficult, it is one of delicacy, falling within the province of the trained surgeon. A few months ago an article appeared by an eminent veterinarian, who proposed a radical change in the technique of this operation, which he said, if successful, would give an operation which anybody could do. When anybody and everybody attempts surgical operations, we know well the results, as for example in ordinary castration. Of course his easy road to success has not yet reached the goal, and never will. The surgical relief for roaring will always remain a surgical operation, to be performed by a surgeon. But it can be performed by any surgeon of reasonable skill.

Aside from the dangers common to all surgical procedures, the only one observed under the present technique is strangling during the first twenty-four, or possibly forty-eight hours. One fatality from this cause occurred in our clinic, due to an error on the part of the caretaker. The danger is readily avoided by the timely use of the laryngeal tube.

Under the present technique, the majority of cases are cured, and will pass a veterinary examination for soundness, and, aside from the inevitable dangers related above, the others are benefited in varying degrees, practically all of them being rendered decidedly more serviceable.

The partial or complete failures are due to a variety of causes, some of which are already well known. In some of our earlier cases, imperfect recovery was due to the removal of the vocal cords and the posterior thyro-arytænoideus muscles, so that the arytænoid cartilage dropped down into the lumen of the cricoid and became firmly adherent there. This difficulty has been overcome by the present technique. In one of our cases incomplete adhesion of the cartilage occurred, a cavity continuing lined with mucosa. Possibly the mucosa was drawn into the space from which the ventricular mucosa had been removed, through cicatricial contraction, but we believe that it was due to our overlooking a portion of the membrane and failing to remove it. A second operation overcame the difficulty.

Woodruff [15] records that in one case he deviated from the technique above recommended by suturing the cutaneous incision. The horse died from sepsis. He also advises that the arytænoid cartilage be secured and retained in the desired position during the healing process by means of a wire loop. He further advises that, in detaching the ventricular mucosa from the underlying tissues, a scalpel handle or other blunt instrument be used. We believe that this causes a greater mutilation of the parts and a greater detachment of the arytænoid from the thyroid than the above described technique. We are not sure that this is best. We have advised instead that the ventricular mucosa be dissected out as neatly as possible with a scalpel, that a minimum of the adjacent areolar tissue be removed, and that the attachments of the arytænoid to the thyroid be disturbed to the least possible extent.

Variations in procedure, with faithful records of the results, constitute the only practicable road to improvement in the now immature technique. On the other hand the technique given assures highly satisfactory results and any important deviations therefrom should first have serious consideration and be capable of overcoming some notable defect which experience has pointed out.

In some cases the operation has failed because it was limited to the left side when the right was also involved. This error has crept into our conception of the nature of roaring and it has been too commonly taught that roaring is so commonly unilateral that the involvement of the right side of the larynx may be safely ignored in practice. Experience contradicts this assumption, and shows a considerable number of very definite involvement of the right side. The deception has been accentuated by comparing the movements of the left and right sides of the larynx when the horse is under anæsthesia, when the left cartilage may be quiescent and the right may still move to some extent. It should be remembered, however, that a horse may roar badly when both cartilages move quite freely. If the muscular apparatus of the larynx is weakened so much that under severe stress the arytænoid cartilage and vocal cords cannot be held in complete abduction, the air stream impacts into the ventricles, balloons them and push the cartilages and vocal cords into the lumen of the larynx, and the animal roars.

The error of operating on one side only when both are defective may usually be avoided or overcome by one of three methods.

The experienced surgeon may determine the condition of the laryngeal muscles on both sides by palpating the larynx of the standing animal and determine whether the uni- or bi-lateral operation is demanded.

The operator may follow the plan proposed by Hobday and make the bi-lateral operation the rule.

Or if the error of operating on the left side only, when both are diseased, has been made the defect may be overcome by a second operation.

While the present technique is of less than two years' standing, the prognosis is based upon a much longer period leading back to 1905, when the plan of operation was initiated from which the present technique has been evolved. During the six years which have elapsed no animal which had apparently been cured has again become a roarer, so far as recorded, except from tracheal or laryngeal stenosis resulting from wounds of the cartilages. The cartilage wounds having been eliminated there is no evidence to suggest that a horse once made respiratorily sound by this operation will ever again roar, because of the disease for which the operation was performed, or from any sequel to the operation.

In the clinics of the New York State Veterinary College and subsidiary thereto, my instructor, Dr. Frost, and myself have operated upon twenty-one horses by the present technique. One needlessly died from strangling due to œdema at the site of operation. Five, or 24 per cent., were not entirely cured, but were quite satisfactory, and fifteen, or 71 per cent., were completely cured and would pass a veterinary examination for soundness.

A colleague purchased as an investment, in the open market, twenty-five roarers. One died from purpura hæmorrhagica apparently not dependent upon the operation. Two were not benefited and were sold without the nature of the failure having been determined. Two were much improved and sold at a profit. Twenty, or 80 per cent., were resold in the market where purchased as sound.

Hobday [8] reports 112 successive satisfactory operations with a large percentage of complete recoveries.

Woodruff [16] reports the results in twenty-eight cases with fourteen recoveries, or decided improvement, five slightly improved, seven not improved, and two fatalities. One died from suturing the cutaneous wound, the other to intra-tracheal abscess, without any known connection with the operation. In general Woodruff departed so far in his technique from that described above that his statistics are scarcely applicable for judging of the merits of the operation.

The technique above described is admittedly immature. The question of anæsthesia merits discussion and the instruments for the operation may very well be improved in various particulars.

The after-handling of the wound is unsatisfactory in that there is much odour for some days. Some way should be devised for overcoming this.

It remains to be determined just how much of the mucosa had best be excised from about the mouth of the ventricle. The present plan is to limit it strictly to the ventricular mucosa. The point is a highly important one because the degree of success apparently rests fundamentally upon the exactness of the judgment of the operator in the amount of the mucosa to be removed.

If the amount removed causes a complete obliteration of the ventricle and the adhesion of the arytænoid cartilage and vocal cords above the cricoid cartilage and in complete abduction the

cure is complete. If too much or too little of the mucosa be removed the result may be incomplete.

We do not yet know that the amount of mucosa to be removed varies between severe and mild cases of roaring, nor that the operation is more successful in the severe than in the mild affection. If the operation is more successful in the severe cases the paralysis may be completed by the surgeon by dividing the recurrent nerve; if more successful in mild cases it would be advisable to operate early in the course of the malady.

The question of whether we should perform the uni- or the bi-lateral operation as a rule of practice cannot yet be settled. The bi-lateral operation unquestionably increases the danger of dyspnœa for the first twenty-four to forty-eight hours, but this can be easily obviated by the insertion of a laryngeal tube.

If the operator fails to recognize the presence of disease on the right side and operates only on the left, the animal continues to roar and a second operation is necessitated. The danger from the second operation, combined with that of the first, is probably little if any greater than from the bi-lateral operation alone, but the expense and delay are doubled.

The advisability of the bi-lateral operation in case of bi-lateral roaring would seem to be beyond discussion. When the right side is sound we fail to see how the condition can be improved by the operation. The difficulty arises, and the chief recommendation for the bi-lateral operation rests chiefly in the uncertainty of diagnosis.

Personally, I yet prefer to operate on both sides only after diagnosing bi-lateral disease by palpation upon the standing animal.

In order to examine the left side of the larynx, the surgeon takes his place on the left side of the neck of the horse, facing in the same direction. The head of the patient is held slightly extended and in a straight line. The palm of the right hand is placed against the lateral surface of the superior extremity of the trachea, the thumb directed downward, the index and second fingers held closely together, flat upon the trachea, directed toward the larynx, the second finger lying in contact with the antero-inferior border of the tendon of the sterno-maxillarus muscle.

Pushing the index and second fingers gently upwards and

forwards between the lateral surface of the larynx and the median surface of the angle of the inferior maxilla, the wing of the thyroid cartilage is followed to its supero-posterior border. If the horse is a roarer, the paralysis and atrophy of the crico-arytænoideus posticus and the arytænoideus muscles leads to the formation of a distinct cavity into which the finger tips readily pass, and the border of the thyroid cartilage, no longer covered by the full muscles, stands out as a bare, sharp border.

The procedure is repeated on the right side in a corresponding manner. If the right side is sound the arytænoid cartilage may still be *pushed* inward, but in case of disease and atrophy the depression is not made but already exists and the finger tips pass into it without resistance.

An interesting question has been raised in some of the published discussions in England regarding the status of a horse as to soundness, which has been a roarer, and in which the symptoms have been removed by this operation. Opinions will vary according to the definition of soundness and the faith in the permanency of the healing process. Once the roaring has been obliterated or benefited by this operation, we have not known of the recurrence of the roaring as the result of any retrograde process in the basic operation itself. When the adherent arytænoid is so placed that it cannot drop into the glottideal opening, the fixation is permanent. No instance has yet been recorded of exuberant granulations at a later period.

In our earlier cases, where cartilaginous wounds were made in our invading incisions, dyspnœa sometimes followed as a result of chondritis months after an apparent cure, but these are aside. When roaring has been removed by excision of the mucosa from the laryngeal ventricle, and the firm adhesion of the arytænoid to the thyroid, the horse is sound of wind. If the roaring is ameliorated at first, the breathing tends to *improve* instead of growing worse with the lapse of time. If a horse has been cured of *Laryngismus paralyticus sinistra* by the excision of the left ventricle, he may later roar from *Laryngismus paralyticus dextra*, but in so far as the roaring being caused by the left arytænoid and vocal cord dropping in is concerned, it is analogous to the removal of the vermiform appendix in man as related to future attacks of appendicitis, or as in the case of the operation we have practised and advocated for some years for poll evil in horses, as

related to a recurrence of that malady. He is, therefore, in the light of our present knowledge, respiratorily sound. His respiratory organs proper have not been disturbed.

He is, however, permanently and irrecoverably unsound in his voice. The operation is not wholly responsible for the loss of voice, it having been already more or less seriously disturbed by the laryngeal paralysis, the operation merely completing what the disease had begun.

Some have protested against the performance of the operation upon entire animals which may be later used for breeding purposes, based upon the general belief in the hereditary character of the malady. It is possible that at some future time the question of the heredity of roaring may be re-opened and discussed from new standpoints.

Heredity is a broad and intricate subject. The horse is hereditarily predisposed to roaring as compared, for example, with the cow. That is, a generic heredity from which the only escape is the abandonment of the genus, or fundamentally changing the character of the horse through selection extending over eons of time.

In Hobday's [8] tabulated report, out of 112 animals operated upon, 94, or 84 per cent. of the total, are classed as hunters, leaving 16 per cent. scattered among other classes. One might conclude from these data that the race of horses known as hunters has a racial heredity towards roaring, from which there is no escape except by abandoning the race or for sportsmen to select their mounts from amongst Clydesdales or similar breeds. Or one might conclude from the same data that following the hounds causes roaring, and that hunting, not heredity, is the cause.

The evidence of an individual hereditary tendency to roaring has always been vague. It has consisted chiefly of the fact that, in a region where roaring prevails, a sire which is a roarer begets roarers, as has been instanced of Ormonde in England, but the fact that Ormonde, a roarer, transported to America, begot sound horses is not weighed. Yet it is believed that, had he been taken to another section of America, his get would have been roarers.

Freely admitting that roaring is hereditary in a given sense, it may be worth our while to study *how* it is hereditary.

We might select a group of affections or defections which

most veterinarians would agree are often hereditary, such as curby hocks, cryptorchidy (monorchidy) and congenital herniæ. We would say that these are due to congenital defects in the structure of the fœtus and that they represent what we may term a "Heredity of Degeneracy."

We have other instances of the hereditary transmission of a tendency to disease which stand in direct opposition to the preceding. The fatal disease known as azoturia attacks a special type of horse, a strong, vigorous, courageous animal of high efficiency, which can only be produced by the mating of a sire and a dam of similar character. The horse stricken with azoturia has inherited from his parents a tendency to the disease.

Another equally, if not more, striking example of the hereditary transmission of a tendency to disease is the parturient paresis or milk fever of cows. The cow so stricken is generally the progeny of an efficient dairy cow and of a bull with a pedigree which warrants the assumption that his daughters will prove efficient milkers. In azoturia and milk fever we have what may be termed a "Hereditary of Exalted Function," which predisposes to disease.

However strongly we may believe in the hereditary character of these two maladies, we do not exclude such animals from the breeding stud; it would be a "Philosophy of Despair." It would stand as an insurmountable obstacle to advancement in animal husbandry. Instead we determine and remove the exciting cause of azoturia and eliminate its ravages, while, thanks to Schmidt, we have an efficient remedy for milk fever which has robbed it of its terrors.

Admitting that there is a hereditary transmission of a tendency to roaring, is it a "Heredity of Exalted Function" or a "Heredity of Degeneracy"? If roaring falls in the former class, is it just to absolutely condemn an affected sire in spite of whatever excellencies he may possess, or to unqualifiedly condemn the operation upon animals capable of breeding?

Numerous instances are recorded of extensive enzootic outbreaks in Europe of roaring due to the feeding of *Lathyrus sativa* (damaged?), and in America similar outbreaks have occurred in the absence of vetches or other legumes in the food, apparently due to mouldy maize (the writer) or other contaminated grain or forage. To what extent is improper food,

housing, or other environment responsible for the comparatively isolated cases of roaring?

A re-opening of the question of the etiology of roaring, followed by a frank and careful study from every point of view might reveal to us a more practical knowledge of its essential etiology and lead to efficient prophylactic measures.

In the meantime we fail to see how a veterinarian can logically refuse surgical relief to a stallion or mare afflicted with roaring on the ground that the animal may later be used for breeding purposes. The future use of the animal is a problem beyond the jurisdiction of the veterinarian. The animal needs and demands relief and the professional duty of the surgeon is plain. The problem of the future identification of these animals, and their exclusion from the breeding stud is another matter, upon which there may well be opposing views.

Regardless of the overwhelming, if not universal; belief in the essentially hereditary character of roaring, it must be self-evident alike to veterinarians and breeders that, with an efficient surgical operation in sight for the relief of the disease, breeders will become less and less exacting in relation to the freedom of sire and dam from roaring. It consequently becomes of greater importance than ever before that its etiology be clearly determined. If it is a "Heredity of Degeneracy," far more rigid measures than heretofore should be taken for eliminating the taint from our breeding studs; if a "Heredity of Exalted Function," the veterinary profession should arouse itself to a vigorous prosecution of the search for the immediate exciting cause, and remove it.

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THE MERITS OF WILLIAMS' OPERATION FOR ROARING.*

BY FREDERICK HOBDAY, F.R.C.V.S., F.R.S.E.,
Kensington, W.

GENTLEMEN,—It was with great pleasure that I acceded to the honour offered to me by the request of Professor Merrillat to prepare a paper upon the merits of Professor Williams' work in connection with "Roaring," a disease which has baffled many investigators during the past hundred years, and I am proud to have been his first collaborator in England and to have made the attempt to further the good work of which he has undoubtedly been the pioneer; but the generous way in which Dr. Williams has always acknowledged work done by other investigators cannot but be put to his credit, and, after all, it is not so much the man who originates ideas who benefits his fellowmen as the one who applies them to a useful end and sees them through until on a safe footing.

Give Professor Gunther all the credit of having tried the operation experimentally, for no man worked more earnestly, but so far as I am able to judge from inquiries made, both in England and in Germany, his results were so unsatisfactory that he not only gave it up himself, but advised his students not to practise it. The translation of his own words: "On account of the uncertainty of the results I never recommended my operation, nor did I allow my students to practise it."

* A paper read before the American Veterinary Association at Toronto, August 24, 1911.

In any case, I do not think his technique can have been the same as that advised by Dr. Williams, for the results as published both by the latter and myself are certainly sufficiently good to make one assert very emphatically that the operation has come to stay and take its proper place as one of those which the modern veterinarian may recommend to his client, affording, as it does, a reasonable prospect of alleviating a very distressing condition even if not effecting a complete cure.

The actual technique of the operation has already been described to you by Williams in the paper he read before the American Veterinary Medical Association in 1906, and although there have been some few modifications since, especially in the avoidance of injury to cartilage, the principles are still the same. I myself lay claim to a few originalities in these modifications; but, from communications with Dr. Williams, I find that certain operators on your side of the Atlantic were then working along the same lines at the same time. I refer principally to the ideas of operating only through the crico-thyroid ligament without injuring either the thyroid or cricoid cartilage, and to the double stripping of both ventricles.

In reference to the latter I have altogether operated now upon over 450 individual horses, more than 200 of which have systematically had the double stripping operation done at the one and the same time; but unluckily such a large proportion of these will not be tested until this winter's hunting season commences, that I cannot in the present paper give you statistics as to the actual results or make the very necessary comparison between the merits of the unilateral and the bilateral operation. I will, however, promise that you shall know them, for although, as Editor of the VETERINARY JOURNAL, I shall naturally desire my own paper to have them first in detail, I will offer them for acceptance and publication to the Editor of the *American Veterinary Review* at the same time, and so arrange matters that they are published simultaneously. I am also undecided for the moment as to whether it is wiser to strip both at the one time or to do the left or paralysed side first, see the result, and then if necessary operate on the other some months later. I have about twenty horses now upon which this plan has been adopted, and certainly in some of them the results have been marvellous. They were all hunters and bad roarers, and the stripping of

the left side alleviated the distress, although they still made considerable noise, whilst the second operation some months later has caused still further amelioration, and in some cases I have reason to hope that the animals will pass veterinary examination for soundness in wind. It is a plan I have adopted recently in several instances where the horses were of great monetary value and the time was of no particular object provided the risk was lessened.

Everybody, owner and groom alike, dislikes the idea of the permanent use of the tracheotomy tube, partly because of the constant trouble of cleansing, and partly on account of the granulations and subsequent stenosis which so often follow as a sequel; and a number of owners have volunteered the statement that if this operation only eases the horse so that it can work without distress, even if still making a noise, they will have it done. Others have gone so far as to say that even if it only gives them one more hunting season and the tube has to be inserted eventually they will be grateful. The operation, however, promises more than this, and I do not think I am exaggerating one bit when I say that it will restore to usefulness quite 90 per cent. of carriage or draught horses and 75 per cent. of hunters, and that a decent proportion of these shall, in addition, pass the average veterinary examination for soundness in wind. I believe, too, that the effect is generally lasting and permanent, as there are now a number under observation in England which have been done over eighteen months and some very nearly two years, whose owners assert that they are still satisfactory in regard to wind.

I agree in the main with what Professor Williams has written in the paper he is presenting to you and of which I have seen a copy, and particularly in regard to the care which must be taken to operate delicately and accurately. I have usually completed the stripping of the mucous membrane after using the special scalpel for the primary incision with the middle finger, but this is probably only a question of habit, and so long as this is wholly stripped without the cartilage becoming injured, the operator may be allowed to decide the point for himself. I firmly support him when he states that it is one of these operations in which it is important to do "just enough and not too much," and especially is it of the utmost import-

ance to get the mucous membrane from the bottom of the sac. It has been of particular interest to note the complete or incomplete adhesion of the ventricle in the cases in which I opened the larynx the second time. Certainly there were some in which the result appeared to be all that I could have desired with the left sac, and yet the horse made considerable noise until the right ventricle had been treated in the same way, but in others there had not been complete closure up to the top, and at this end there was orifice enough to insert the end of the middle or forefinger. In regard to early interference I have hesitated to advise owners to have an animal done which was only a *slight* whistler, but several have had them done on their own initiative and I must say that the results have certainly been excellent, and the several horses have been reported afterwards, where tested, to be "sound in wind." I have at the end of this hunting season done a fair number which were only reported as whistlers, but my statistics on this point cannot be complete until more time has elapsed.

I say this advisedly, because I consider that if chondritis proves at all a sequel to be dreaded even by the most careful operation, then I maintain that it will be better to advise an owner with a whistler which is not distressed and does not cause him great annoyance, to work that horse another season or until he is really a roarer. If, on the other hand, a large proportion of these "whistlers" become "sound" horses in so far as their wind is concerned and the result is permanent, I should certainly advise in the future that the operation is done in the early stages of the disease.

I mention the fear of chondritis afterwards because I see that Dr. Williams has alluded to it as a very serious factor in the earlier attempts he made, and I know, too, that it was the great bugbear to Müller, Cadiot, Fleming, Fred Smith, Axe, Raymond, and others who performed arytænoidectomy, but until the end of May of this year (over eighteen months since the first operation was demonstrated in England) I had never met with a single case or one even suspicious of it. In the month of May last I saw three cases and one other was reported to me, in all of which the larynx has become distinctly enlarged and very hard—in fact, ossified—as a sequel to the operation. In three of them I verified the fact by cutting down

on to the larynx and exposing it. None of the horses have yet died, so that I have no larynx to show you. I decided not to open it nor to look inside as I was afraid I might not get my wound to heal again, and two of the horses were useful enough and could gallop without distress although making considerable noise. Two of these had had the left ventricle alone stripped and the other two had been through the bilateral operation. Two had begun to develop symptoms of dyspnœa when galloped, and before being hunted again would certainly have to be "tubed."

I mentioned above that I did not re-open the ossified larynx as I feared it might not heal readily, and my reason for this was that I had heard that sometimes a troublesome sinus formed and that this was very difficult to close; in fact, one such instance had occurred amongst my own cases.

I have thought from observations made that to assist in avoiding both the above complications the patients should not afterwards be turned out to grass, but be manger fed, partly because of the dependent position of the head during grazing, and partly because of the continuous movement of the muscles of the larynx and throat for so long a period of the day as is necessitated by a horse turned out to pasture. Until the part of the injured larynx has completely cicatrized I think it to be very essential that this organ and its surrounding muscles and the other structures should be allowed as much rest as possible.

Untoward Sequelæ.

Of the bad sequelæ likely to follow as the result of the operation, in addition to the fear of chondritis and a troublesome sinus as mentioned above, my own experience has brought me in contact with deaths from asphyxia and from septicæmia, and of each I have had two instances. Until case 206 I never had the slightest anxiety or trouble, but this one broke the record by dying of septicæmia. I thought that we should get a better and quicker adhesion of the right vocal cord (which moved freely) by performing tracheotomy at the same time. My knowledge of physiology was defective, or I should have known that the mere fact of the respiratory air passing in and out of a tube in the trachea made no difference whatever in the move-

ment of the vocal cords. A septic infection took place, a condition which, of course, might have occurred as a sequel to any operation, and the patient died on the fifth day afterwards. The second septicæmia case also died on the fifth day.

The deaths from asphyxia are worth recording, because they will form a warning to other operators to carefully watch their cases during the forty-eight hours subsequent to operation. Both were horses which had previously worn tracheotomy tubes for some time, and in one there was extensive stenosis of the trachea. I ought to have left the tubes in until after they had become convalescent from the laryngeal wound, but in the one case I allowed it to heal up before operating, and in the other case I purposely closed it up at the same time that the ventricular mucous membrane was stripped. In each case a very sudden spasm of the larynx appeared to take place, and death occurred in a few minutes from asphyxia before tracheotomy could be performed, or even a laryngeal tube inserted.

Since introducing the double stripping operation as a routine measure, tracheotomy has had to be performed several times, owing to threatened asphyxia, and the tube left *in situ* for an average period of three to four days; but this is a comparatively minor matter in a hunter, although annoying in a show animal, and the use of a laryngeal tube in the latter may be better. Professor Williams has, I believe, one of his own pattern, and I have had one made with flattened sides, so that the vocal cords do not become impinged upon more than is necessary for fear of ulceration or abrasion. All these occurred after double stripping and usually within twenty-four hours, but we always keep the patient under close observation for forty-eight hours, and in two instances no disturbance of respiration occurred until the third day afterwards, although these were not alarming enough to necessitate tracheotomy. The earliest time at which symptoms of dyspnœa occurred was three hours afterwards, but the majority showed signs of trouble between the fifth and twelfth hours. This dyspnœa may be due to œdema and swelling of the vocal cords or to a sudden spasm or paralysis of these organs, and generally one has at least a couple of hours' warning in the shape of disturbed and noisy breathing which gradually becomes worse. Tracheotomy gives instant relief, and the horse in half-an-hour is usually feeding calmly as if nothing had happened.

Legal Aspect.

It would be impossible, in a short paper like this, to take note of every side of the question, but I have often been asked whether a horse which is shown to have been successfully operated upon should be passed as "sound in wind." That they have been, and that many more will be, I am quite convinced, for I will defy even a veterinary surgeon to detect the scar in fully 80 per cent. of the patients six months after the operation, and until three months ago I would certainly have advised a client that a hunter which had been operated upon a period of six months previously for roaring, and was now noiseless, would be worth more than a horse which had not been done and might go wrong in wind any time. Since, however, seeing the four cases of chondritis and ossification of the larynx which I alluded to above, I think it is only fair that we should know more about the percentages of this sequel before giving too decided an opinion. Time and careful observation alone can settle this point, as also whether one is justified in operating upon a stallion or a brood mare. For my own part, although I fully admit the hereditary aspect of the question, I also know full well that strangles plays an equally large share in the production of roarers, and where this disease has been the cause I do not think that one need hesitate on conscientious grounds to operate. Eliminate these two factors, heredity and strangles, and one would almost banish roarers off the face of the earth.

In reference to the detection of the fact as to whether an animal has been operated upon or not, as I stated a few lines above, it is often quite impossible to detect any scar, and even if one is present it is often almost indistinguishable from the "curl" in the hair which is often present in that situation. The only sure method I know of is to make some effort to cause the horse to attempt to neigh. With a mare having a foal at foot, to remove it and allow her to attempt to approach it, acts very satisfactorily, or, if possible, starve the suspect for some hours and rattle a stable bucket within ear-shot; the resulting effort to neigh gives a totally different sound to that of a healthy horse, for the horse will either be dumb or neigh with a peculiar muffled effort.

I am often asked whether a horse which has been successfully

operated upon can be entered into a sale, or sold privately, as a "good hunter." The usual definition of a "good hunter," as understood in England, is that written at the head of Tattersall's catalogue, in which it states that a horse described as a "good hunter" must be "sound in wind and eyes."

Is a *ci-devant* roarer legally "sound in wind"?

Some day or other the lawyers will have to decide the point, and until then I think we cannot offer an opinion that will stand.

No operation cures every case upon which it is tried, and the operation for roaring is no exception to the rule. But the results which have followed the technique advised by our colleague, Dr. Williams, have been so encouraging that we cannot help but feel that we are at last upon the right track, and that owners and veterinarians alike, not to mention the equine world itself, owe him a debt of gratitude for his dogged perseverance in the face of much discouragement and many difficulties. Let us all do our best to help him to work the matter to a finality, and to carry it out to an absolute and, as far as possible, a universal and uniform success.

CORRECTIONS.

We have received the following note from Mr. L. E. W. Bevan, relating to his article in the July issue of the VETERINARY JOURNAL:—

"In the article on the transmission of horse-sickness through the dog, there are one or two mistakes which should be corrected:—

Page 404, line 6 from top, *for* (from hound "Gwelo") *read* (from hound, Gwelo,)

Page 406, temperature reading of horse "Saba," *for*

Date.		Number of Days.		Temperature. Morning.		Evening.	
March 27, 1911	...	6	...	100·6 °F.	...	108·4 °F.	
,, 28, ,,	...	7	...	102·2 ,,	...	108·8 ,,	*read*
March 27, 1911	...	6	...	100·6 °F.	...	102·4 °F.	
,, 28, ,,	...	7	...	102·2 ,,	...	102·8 ,,	

Clinical Articles.

TEN CASES OF ROARING, TREATED BY EXCISION OF THE LARYNGEAL VENTRICLE.

By J. J. O'CONNOR, M.R.C.V.S.
Professor in the Royal Veterinary College of Ireland, Dublin.

No. 1.—Aged chestnut gelding, a splendid hunter, a loud roarer. Had a tube in his trachea and it was in consequence of this tube "becoming troublesome" that the owner had him operated upon for roaring. The tube was removed at the time of operation. On opening the larynx the left arytænoid was seen to be completely paralyzed. The left ventricle only was stripped.

Result.—Stenosis of the trachea occurred when tracheotomy had been performed causing dyspnœa, and the owner had the horse destroyed.

No 2.—Aged brown gelding, a good hunter, a distinct roarer. Left arytænoid completely paralysed. Left ventricle only stripped.

Result.—A complete success. Only a faint noise can be heard when quite close to the animal during a gallop, whereas prior to the operation the roaring could be heard at a long distance.

No. 3.—A five-year-old hunter, making a noise. Left arytænoid paralyzed. Left ventricle stripped.

Result.—Operation successful. Hunts and stays well, only making a slight noise when starting to gallop.

No. 4.—A four-year-old brown thoroughbred stallion making a noise. Both arytænoids moved equally, but it was thought more slowly than normal. Both ventricles were stripped.

Result.—Not improved two months after the operation, when he was sold and lost sight of.

No. 5.—Bay gelding, making a noise, left arytænoid moving feebly. Stripped the left ventricle.

Result.—The horse, I was informed, became incurably lame, was not tried, and was got rid of.

No. 6.—Bay mare, a trooper, making a noise. Operated on both ventricles by the trephine method. By this method both thyro-arytænoid muscles were exposed, and were not atrophied.

* As reported to the Veterinary Medical Association, Ireland, May 26, 1911.

after a short time one said he thought the left cartilage was not acting as well as the other, and another stated that he thought there was a slight difference, and the third said he was of the opinion that both were the same. The skin wound was made not quite so long as usual. The horse got up before he had completely recovered from the chloroform, staggered and fell heavily, and the breathing became very distressed; however, he was held down for fully twenty minutes, and when he got up he at once ate a mash of bran, and seemed no worse for his tumble, but his breathing was very loud and distressed; for the next five days he partook of no food, and his breathing became so much worse that it seemed almost imperative to perform tracheotomy. On the sixth day his lungs became affected; he received some fever drenches, and his sides were stimulated with mustard. Three hours afterwards he ate a small mash of bran, and slowly made a good recovery. However, up to the present, five months since the operation, the noise is no better than it was before the operation.

No. 10.—Aged bay hunter gelding, a splendid hunter, a loud roarer. Stays an ordinary hunt well, as on account of his big stride he is seldom fully extended, but when the hunt is very fast he shows distress. Both ventricles operated upon. The left arytænoid completely paralyzed. Not yet tried.

Remarks.—In no case did a horse die as the result of the operation. Some of the cases showed accelerated breathing for a few days after the operation, but No. 9 was the only horse which showed evident distress and decided dyspnœa, lasting for five days after the operation. No. 10 was not affected in the least in his respirations at any time after being operated upon. The conclusion I have come to from the foregoing cases is that when the arytænoid is undoubtedly paralyzed the operation is likely to be successful, but if the cartilage is not paralyzed a successful result need not be expected. It is evident that many horses make a noise from other causes than paralyzis of the arytænoid cartilage, and the noise is called roaring or whistling for the want of a better name. Up to the present I am sure many such cases have been operated upon as roarers or whistlers, and have been numbered as examples of failures of the operation. I feel convinced that the reputation of the operation is being damaged in this way.

No. 6 is a striking example of a horse making a noise without paralyzis of the arytænoids, for both the thyro-arytænoid muscles were dark red and fleshy in this case, showing that they were not atrophied from paralyzis. The loud grunting noise made by the horse when tried about three months after the operation was so extraordinary, resembling somewhat the roar of a lion, that it was thought there was some abnormal thickening in the larynx at the seat of operation. Consequently the larynx was opened in the hope that something might be done to remedy the defect—if present. When the interior of the larynx was examined, the ventricles were found beautifully obliterated, the arytænoids standing well out of the lumen, and the mucous membrane throughout was as smooth as if nothing had been done to the larynx. There was no thickening of the thyroid cartilage, either inside or outside the larynx. The roaring in this case was evidently not of laryngeal origin, as there was nothing in the larynx to account for such a noise.

PUNCTURED WOUND IN A COB.

By G. MAYALL, M.R.C.V.S.,
Bolton.

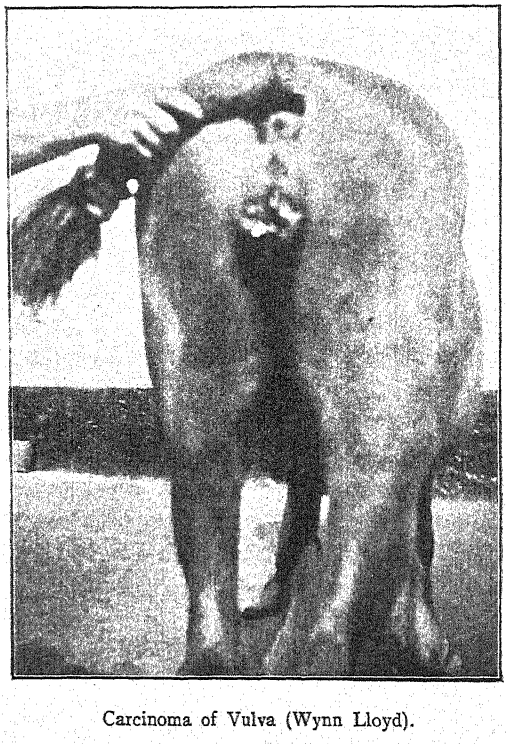
Bay cob, six years old, brought to the yard on August 4 suffering from a punctured wound on a level with the right elbow joint and extending from the elbow to beneath the skin of the chest, but not passing through it. It was over a foot in depth, and its external orifice measured 3 in. The off fore-leg was dragged along the ground. The wound was syringed out with 1 in 1,000 mercuric potassic iodide solution and plugged with surgical wool soaked in carbolized oil 1 in 10. A dose of physic was given to the cob, and the chest and shoulder, under the skin of which air could be detected, well rubbed with an emollient liniment. The owner, being away all day, gave up the key of the stable to us, and the cob's wound was syringed out daily with mercuric iodide solution from August 4 to 22, and plugged from the 4th to the 14th. He went to work on August 23. Little pus formed and the lameness gradually declined, so that on August 14 he could put the off fore-leg down, bear weight on it, and move forward and backwards fairly well. My only object in recording this case is to call attention to the fact that there was very little

suppuration indeed, the wound kept fresh and healthy although only dressed and syringed once a day. Carbolized oil was one of the antiseptics used; the stable was a small one and the atmosphere was offensive on entering; the wound took eighteen days to heal sufficiently for the animal to go to work.

The cause of the punctured wound was never ascertained. The cob had been left unattended, got away at a slow pace with the cart, and was run into and knocked down at a corner by another vehicle. Nothing on the colliding vehicle could be seen to have caused the injury, although it was examined minutely. Nothing on the owner's cart or harness could be traced to have occasioned the wound.

CARCINOMA OF THE VULVA OF A MARE.

By L. W. WYNN LLOYD, M.R.C.V.S.
Carnarvon.



Carcinoma of Vulva (Wynn Lloyd).

THE subject of the accompanying photograph was an aged Welsh mare, 14 hands.

The growth, which was the size of a man's fist, was ill-defined and caused no apparent inconvenience beyond matting of the hair on the tail and buttocks with blood and discharges.

The tumour was fixed to the lower third of the lips of the vulva and along the floor of the vagina for about 2 in.

The tail and buttocks having been thoroughly washed and the parts cleansed with antiseptic, I injected codrenine at several points into the tumour.

An assistant on either side separated the lips of the vulva and the growth was carefully dissected out. Bleeding vessels were ligatured and a plug of antiseptic wool placed in the hollow in the floor of the vagina. The mare was sent home the following day and treated with antiseptic dressings, and is doing well.

The tumour was sent to Professor Wooldridge, who kindly examined it and declared it to be Carcinoma.

There were no signs of secondary growths, and as we got to the apparent limits of the growth it is hoped there may not be any recurrence.

Canine Clinical Note.

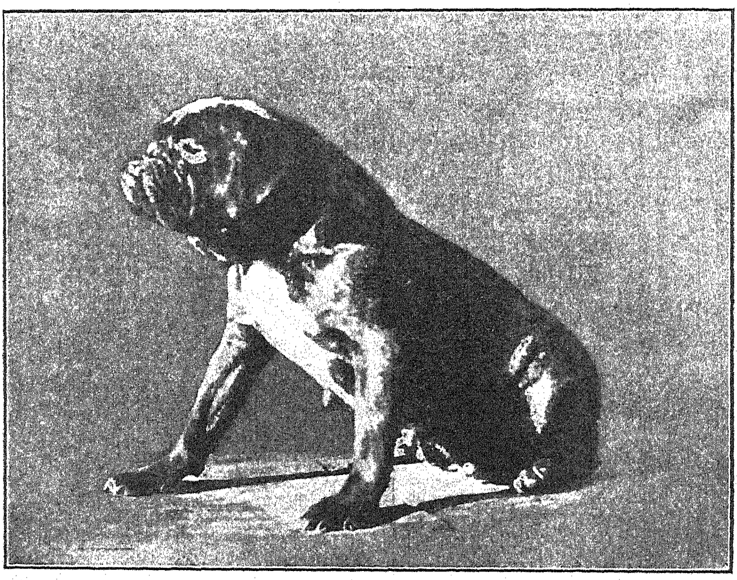
CÆSAREAN SECTION IN THE BITCH.

By G. MAYALL, M.R.C.V.S.,
Bolton.

THE subject was a brindle bull bitch, "Midge," aged 22 months, pregnant with her second litter. I was called by telephone to attend her at a distance of four miles from the surgery. One dead pup had been delivered by the owner's husband at five o'clock in the morning, and at 11 a.m., when I attended and made an examination, I could just touch the tip of the nose of a second pup. I prescribed liquid extract of ergot 15 minims, and told the owner I would call again about 5 p.m. At my second visit I found that the bitch had made little further progress, but could feel up to the stop of the face of the pup, and at the owner's request proceeded to try and effect delivery. I found it impossible to get the fore feet up and to make any progress with the head unless by smashing the cranial bones.

This I did, and found evidence that the pup had been dead some time, as traction on the head caused it to come away in bits. After working for about two hours, and using all necessary instruments (which had been carefully sterilized previous to operating and were taken out of carbolic solution as they were used) and putting the bitch in various postures, I came to the conclusion that delivery could not be effected by the vagina, and advised the performance of Cæsarean section; to this the owner consented.

The subject was brought into the infirmary at 9.30 p.m. on



"Midge" after the Cæsarean Section.

August 17, and the operation commenced at 10 o'clock, the husband of the owner and my man giving a helping hand. The external region was cleansed, clipped, washed with carbolic soap and swabbed with mercuric iodide solution, and the bitch put on the operating table and chloroformed. An incision five inches long was made through the skin and wall of the abdomen and the edges of the wounds swabbed with renaglandin (Oppenheimer). The uterus was explored and only one pup found therein. The organ was then drawn out and incised by a cut just large enough to allow of extraction of the fœtus; this was a

big one minus the head. The uterus near its incised edges was swabbed out with chinosol solution and the edges of the incision painted with renaglandin. Two rows of interrupted catgut sutures were put in the uterus, the second row burying the first, the edges of the wound being inverted, the abdominal muscles were sutured with catgut and the skin with sterilized hempen cord, both lots being of the interrupted variety.

A pad of boricated cotton wool was put over the wound, and a many-tailed bandage with two holes in for the hind legs applied. The operation from start to finish lasted forty minutes, the bitch being under chloroform the whole time and recovered well from its effects. Next day the external wound was powdered with boric acid and clean wool and bandage applied. The same on August 19. On August 20 the bitch had displaced the bandage and got at the stitches, four of them being out, and the heavy pendulous udder was exerting a good bit of traction on the remaining sutures. There was discharge from the external wound and also from the vulva, neither of which smelt badly. Syringed her out with warm hydrogen peroxide 20 vols. (1 in 10 solution), and also again two days later. Replaced the sutures, painted the external wound with iodoform collodion and discarded the bandage. On the three following days sutures which had broken out had to be replaced and the collodion painting renewed, and on one of these days we could plainly see the healed uterus and the intestines internally. On the twelfth day the wall of the abdomen had closed and the skin wound alone gave trouble. This was powdered with boric acid and occasionally touched with block alum. The temperature of the bitch never rose above three-fifths of a degree from normal, and slight diarrhœa only was noticed on the tenth day. On September 9 she was discharged cured.

I attribute the good result, which rather surprised me after the prolonged parturition operations, to keeping the bitch on nothing but barley water (Robinson's patent barley) and milk after the operation, to syringing her out with hydrogen peroxide which some may think was done too soon, but good effects of which when used early have been noted on other occasions, to careful aseptic and antiseptic precautions at the time of operating, and to the good constitution of the patient. The interference with the sutures and the pendulous nature of the bitch's mammæ

and abdomen were against us, but careful attention pulled her through, much to the delight of her owner, with whom she is a great favourite. I enclose herewith "Midge's" photo for reproduction.

Translations.

FOOT-AND-MOUTH DISEASE OF SUCKLINGS.

By DANIEL GERO.

In the last outbreak of foot-and-mouth disease in Hungary in the autumn and still more in the winter of the year 1910, there were many mortality cases in two to three-weeks-old suckling animals which without previous illness died suddenly. The number of losses may be placed at 60 to 70 per cent. The cause of this lamentable state of affairs appeared to be that the complaint had reached its highest point at the time of the births. In the sucklings no characteristic changes (vesicles, &c.) of foot-and-mouth disease were seen, and in these cases the udder was not always affected, so that it may be considered that the toxic material was passed into the milk of the sick mother animals from the blood.

On *post mortem* there was acute catarrh of the stomach and intestine, parenchymatous degeneration, waxy degeneration of the heart muscle; but often the *post mortem* gave negative results. Good measures to check the number of bad results consisted in removal of the youngsters at once and bringing them up on boiled milk.

(Allatorvosi Lapok.)

CONTAGIOUS PNEUMONIA OF GOATS.

By District Veterinary Surgeon MAX POLGAR and Military Veterinary Surgeon HUBERT KRIESCHE.

Some Angora goats being conveyed from their country to Trebinje were attacked with infectious pneumonia. Out of seventeen goats taken three died on the way and four were visibly ill when landing at Gravosa, one of them dying shortly after; the other three were separated and treated. The clinical symptoms of one goal were: Temp. 40.5° C., laboured breathing 45, pulse scarcely perceptible, heart beats 208 a minute, discharge from the nose, mucous membranes pale, bronchial breathing, rattling and whistling sounds, dry painful cough, lameness of the hind legs. Death occurred in three days. On skinning there were whitish sodden infiltrations at the head and over the abdominal region. On opening the cadaver, the lower half of the lungs showed lobular hepatisation, the cut surface was empty

of air, the parts of the lung dry and reddish-grey in colour, the pleuræ strewn with limp fibrous masses. The two other goats showed similar symptoms and were taken to their destination in a wagon.

The disease was similar and probably identical to that described by Hutcheon and Steel in South Africa, and related to that seen by Nicolle and Refik Bey in Anatolia.

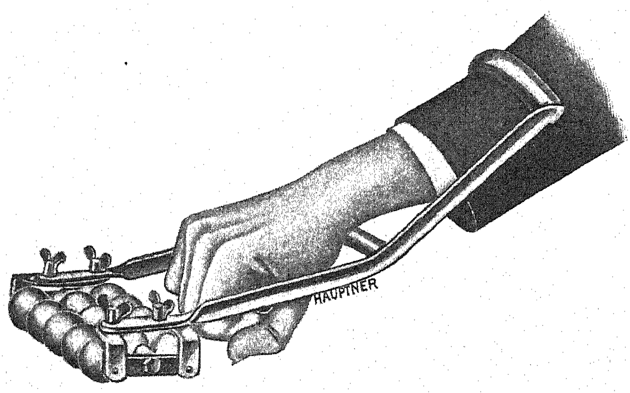
(*Oesterreichische Woch. für Tierheilkunde.*)

AN INSTRUMENT FOR MASSAGE OF THE HORSE AND OX.

By RAEBIGER,

Bielefeld.

Massage is useful for shoulder, croup and loin lamenesses as well as for general treatment of skin and muscle. Hand massage requires too much strength on the part of the operator, and instruments hitherto used have been unsatisfactory. I have constructed an apparatus which visibly lightens the work of the masseur, and can be used without any exercise of great bodily strength on the part of the operator. The apparatus consists of three rows of balls, each revolving in an axis, and the whole



portion of the body acted on by the instrument comes in contact with these balls. A good framework enables them to be grasped by the hand and arm. The balls can be adjusted for deep or shallow massage. Chronic shoulder and loin lamenesses, muscular atrophy, badly-formed muscles of the shoulder, loins, and croup of young animals and breeding cattle have been favourably influenced by roller and ball massage. The firm of Hauptner, of Berlin, are the makers of the instrument.

(*Deutsche Tierärzt. Woch.*)

Miscellaneous.

THE AMERICAN VETERINARY ASSOCIATION.

THE American Veterinary Association held their annual meeting this year at Toronto, and there was an attendance of over 800 veterinary surgeons from all parts of the United States and Canada. About 120 new members were enrolled, and the proceedings were in every way well organized and successfully carried out. Many interesting papers were read and a whole day was given up to practical demonstrations, some twenty operations being performed by specialists in each respective branch. The operations included: in the horse, several cryptorchids, three roarers, tenotomies for the relief of poll evil, and in the dog and cat for various kinds of surgical ailments. Needless to say, the members displayed the keenest interest throughout.

Amongst other toasts given at the banquet, which was presided over by Mr. Rutherford, that of the "Royal College of Veterinary Surgeons," was proposed and honoured. The Association is doing excellent work in America, especially in the way by which it is helping forward the educational status of the veterinary surgeon.

Letters and Communications, &c.

Mr. E. W. Hoare; Mr. L. E. W. Bevan; Mr. L. W. Wynn Lloyd; Mr. G. Mayall; Professor O'Connor; Professor Craig; Dr. Stapley; Professor W. L. Williams; Dr. Hughes; Pasteur Vaccine Co.; Messrs. Arnold and Sons; Messrs. Allen and Hanbury; Spratt's, Ltd.; The British South Africa Co.; Bureau of Animal Industry, U.S.A.; Mr. E. W. Oliver; Mr. A. M. Trotter; Professor Nuttall.

Books and Periodicals, &c., Received.

The Indian Veterinary Journal; Bulletin of the Bureau of Sleeping Sickness; Veterinary Bacteriology, by Dr. R. E. Buchanan (pp. 516, illustrated, 13s. net.), Messrs. Saunders and Co., London; Annual Report of the Punjaub Veterinary College; Annual Report, C.V.D., United Provinces; Annual Report of the Veterinary Surgeons to the City of Glasgow; Memoirs of the I.C.V.D.; Tropical Agriculturist; Annual Report of the Director-General, A.V.S.: Ticks, a monograph of the Ixodoidea, by Nuttall and Warburton (Cambridge University Press).

NOTE.—All communications should be addressed to 8, Henrietta Street, Covent Garden, London, W.C. Telephone, 4646 Gerrard. Telegrams, "Baillière, London."

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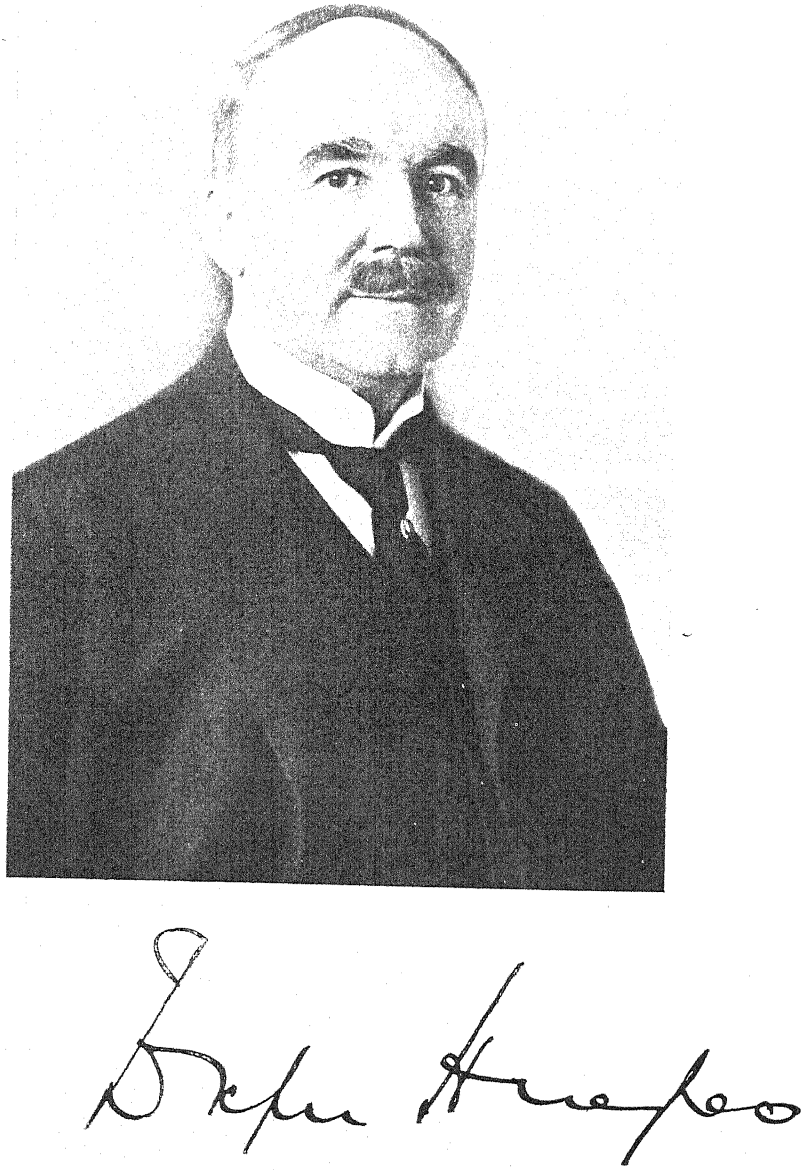

THE

VETERINARY JOURNAL

NOVEMBER, 1911.

Editorials.

THE PRACTITIONERS' DESIRE FOR ADDITIONS TO THE SUBJECTS OF THE PRESENT POST-GRADUATE COURSES.

POST-GRADUATE study was the predominant note throughout the excellent inaugural address delivered by Mr. Stockman at the opening of the session at the Camden Town School, and which appears elsewhere in this issue. The realization by the veterinary profession of this country of the necessity for such study has been a very pleasing feature in recent years, and the way in which advantage has been taken of the institution of special post-graduate courses of instruction speaks for itself. That such courses serve a most useful purpose must be admitted at once. They afford a means of obtaining a considerable amount of advanced special knowledge in a limited time, a matter of vital importance to men engaged in private practice and holding local inspectorships. Obviously such men cannot possibly afford to leave their practices for long periods of time, and needs must take advantage of what has been referred to sometimes, in more or less sarcastic vein, as "spoon food." But it was not so much to this conventional course of post-graduate study that Mr. Stockman wished to draw attention "as to that kind of

education a man may seek out for himself and to a certain extent direct." There can be no doubt that this is the best line of study, but, heretofore, time and expense have stood in the way of more than a few who would have made excellent investigators. It would seem, however, that new opportunities are being offered to our younger graduates now in the form of scholarships of the value of £150 a year for three years so that they may train as investigators. We earnestly trust that full advantage will be taken of this offer of the Board of Agriculture, and we are hopeful that much good will come of it.

In the past, post-graduate study of the independent and self-directed type has, as a rule, been well rewarded, and numerous examples could be quoted. We will not do more, however, than to point out those whose names are mentioned in that excellent series of articles, the first of which, from the facile pen of Dr. Arthur Hughes, we published in our last issue and continue in this, concerning "Members of the Royal College of Veterinary Surgeons who have achieved distinction in the United States of America." Such men as Law, Dalrymple, Joseph Hughes, Hassall, Peters, and Liautard have made veterinary history, solely, in the first place, as the result of well-directed and self-guided post-graduate study. Our younger men now have facilities offered to them such as those men never dreamed of; and with those facilities, of course, are responsibilities, for on them the future of the veterinary profession depends. Let them see to it that the opportunities are not missed.

In reference to the fixed courses of post-graduate instruction, as provided at various institutions, it is certainly strange that they are all limited to pathology, bacteriology, protozoology, and to sanitary science. We consider it strange, because by far the largest number of veterinary surgeons are engaged in general practice, and yet no effort appears to have been made to provide a post-graduate course of instruction for them in the numerous recent advances in surgical and medical practice. We feel certain that if such a course were instituted it would be taken advantage of to the fullest extent. Striking evidence on this point is afforded by the increased attendance at meetings of veterinary societies when any surgical demonstration is to be given. Even though it often happens that most of the people attending can only see in a very imperfect manner what is being done, yet their

keenness to see that little and to ask questions and learn about it is striking testimony in support of our view. Then why do not the colleges provide it? It would be a financial success to them, and numerous practitioners would hail such additional subjects with delight.

THE AMERICAN VETERINARY MEDICAL ASSOCIATION.

THAT the veterinary profession in America is very active and making very rapid strides is the impression that all will hold after reading the brief report of the meeting of the above Association, on pages 698 *et seq.* The papers were very varied and numerous, and together contain an enormous amount of valuable information.

The Presidential Address of Mr. George Glover was very significant of progress and deep thought on behalf of his professional brethren. That America should welcome with open arms the graduates of foreign schools, whilst the American diploma was not recognized as a licence to practise in European countries, was a condition of affairs which he emphasized as one which should not exist, and he used it as a strong plea for a higher and uniform matriculation standard and a more uniform and prolonged college course. The multiplicity of graduation titles, too, was touched upon, as in America one finds that, instead of the uniform M.R.C.V.S. which we use in England, and which is the useful outcome of our one portal system, the American veterinarian has the selection of V.S., M.D.V., D.V.M., B.V.Sc., and others, which each indicate, to those who know the signification, the school from which the licence to practise has been issued.

The one portal system would be impossible in America on account of the long distances over which any one body of examiners would have to travel, but some attempt at uniformity in the title or qualification issued might be possible, if one could but overcome the pride which is naturally felt by each individual college in the title it has created, and the prestige of which it has maintained for so many years. That as far as was possible

a higher entrance educational standard should be adopted, and that this at least should be uniform, was particularly dwelt upon by Mr. Glover, and in this he had the hearty support of the Association.

It would be well to explain here that the American Veterinary Medical Association, consisting as it does of more than 1,500 members, and including all the most earnest workers and well-wishers of the veterinary profession in the United States and Canada, has done, and is doing, an immense amount of good. By refusing to accept as members the graduates of certain lower-grade so-called colleges, by the resolutions it has sent up from time to time to various Government and local authorities, by the pressure it has brought to bear in many ways, and by arranging for papers, discussions, and practical demonstrations on up-to-date subjects, the Association has become a power in the land, and its membership is valued very highly. It caters for every branch of the profession, and in devoting the whole of the last day to demonstrations and operations which are of interest and value to the general practitioner, our National Veterinary Association might well take a leaf out of its book.

General Articles.

SOME MEMBERS OF THE ROYAL COLLEGE OF VETERINARY SURGEONS WHO HAVE ACHIEVED NATIONAL DISTINCTION IN COMPARATIVE MEDICINE IN THE UNITED STATES OF AMERICA.

By Dr. ARTHUR HUGHES, Litt.M., Ph.D. (Cornell University), D.V.M. (New York State Veterinary College),

II.—William Haddock Dalrymple, M.R.C.V.S.

(*Continued from page* 591.)

Mr. Dalrymple has been Secretary of Louisiana State Agricultural Society and Louisiana Stock Breeders' Association since 1897; President United States Experiment Station Veterinary Association, 1898-1899; President of the American Veterinary Medical Association, 1907-1908; member of the Executive Committee National Live Stock Association, 1902; member of Louisiana State Live Stock Sanitary Board, 1910; President Louisiana State Veterinary Medical Association, 1910; President National Live Stock Sanitary Association. In 1905 his name was one of five submitted by the American Veterinary Medical Association to be voted on for Chief of the Bureau of Animal Industry, U.S. Department of Agriculture. Twice he has been offered important permanent official positions, once as Head of the Veterinary Division of Iowa State Agricultural College; again to be Chief Veterinarian of the Philippine Islands, both of which positions he refused. He was made a member of the Advisory Board of the United States Agricultural and Industrial Exposition Committee, 1910; member of the Royal Institute of Public Health, London; of the International Congress on Tuberculosis, 1908; American Public Health Association; honorary member of the Louisiana Naturalists' Club; member of the American Association for the Advancement of Science, 1910; member of the Authors' Club, London, 1910. He was elected a member of the Royal Society of Arts, London, 1911.

A tabulation of the subjects of the articles which Professor Dalrymple has written would itself fill a large-sized pamphlet, and they have been written for numerous magazines. Many of

them have been printed speeches; many more have been special articles on a wide range of subjects, from pamphlets on agricultural topics in popular speech to elaborate scientific articles for the veterinary or medical Press. We may illustrate this by reference to some of his most recent writings. We find him lately chief commencement speaker at the Kansas City Veterinary College, 1911, at which he makes an address replete with wisdom and fraternal advice; writing an article on the depletion of cattle caused by ticks and its relation to milk secretion, for the *Quarterly Bulletin* of the Louisiana State Board of Health; assisting by advice in the publication of the biennial report of the Louisiana State Live Stock Sanitary Board; assisting the great railroads to bring agricultural settlers to the Southern States by writing descriptive articles for them; inditing articles one after the other for *The Breeders' Gazette* (a great live stock journal) on agricultural conditions and live stock matters; successfully forming a league among farmers in Louisiana to exterminate ticks on cattle causing redwater; publishing an article for *The Gulf States Farmer* on live stock interests in the Southern States; devising and publishing pictorial material as a "tuberculosis demonstration" with the object of illustrating the danger of bovine tuberculosis to man. These, too, are only a few of Dalrymple's activities within 1910-1911.

From these remarks it is easy to see that such a worker must have achieved national distinction in his field of labour. Dalrymple has that clear vision in his sphere of activity which has enabled him to successfully start movements for the good of the whole profession. He has always been the organizer, the leader, the man who is willing to take on his shoulders the burden of work; to take the initiative in things; to whip matters into shape so that success will follow the effort; to prompt others how work may properly be done, then to step aside and let the work, well started and organized, go on. This form of potency is recognized in the offices for which he has been chosen, and which he has so successfully filled. These have been local offices in Baton Rouge, State offices in Louisiana, city scientific offices in New Orleans, and chief executive office in national live stock and veterinary bodies. In each the wakefulness of his intellect has given him the insight into present and future needs, and to discern possible lines of progress in each.

There are other means which have enabled him to do these things. He is a man of engaging personality who strikes those he meets as a man in whom confidence should be placed. His appearance is of a kind to make one think that his natural bent is to be a "master of assemblies." He has calmness of nature which makes him at home as an executive officer, to which is added hard Scotch sense and habitual serenity. His literary gift is omnipresent. He has the power to marshal hurriedly, at a sitting or two, just the facts, in just such an order, and with just such sparkle as will make them presentable to an audience. His speeches are always shot through with good sense. He has a great knack of pamphleteering, and his pamphlets are sure to hit the mark. His university position he has filled more than acceptably. But he has struck out from mere routine. Before agricultural, medical, veterinary, or other bodies he is equally at home. If we may be permitted to use a colloquialism, the veterinarian does not "stick out on him"—he is not a blatant veterinarian. No one thinks of him as primarily and exclusively the veterinarian. Veterinary science is to him a tool for the advancement of the public interests.

III.—Joseph Hughes, M.R.C.V.S.

On May 20, 1859, on a farm near Dundalk, County Louth, Ireland, Joseph Hughes was born. With a touch of Hibernian humour he tells the story that Dundalk is called the "Gap of the North," as it is just between the formidable orange and green sections—a peaceful region where no violent passions blaze. His early training was obtained in the National School of Dundalk. Between 1870-1875 he was at the Christian Brothers School; then for two years at St. Mary's College, all near his home. He then took up farming with his father and brother. Many will remember that those years (1878-1879) were the wettest possible. Everything rotted. The Hughes's little farm stock was steadily beset by a variety of diseases. During that period the farms of the region were quarantined for contagious pleuro-pneumonia and foot-and-mouth disease. Between 1877-1879 the liver fluke, *Distoma hepaticum*, which was then a new parasitism for the region, decimated the sheep of the Hughes' farm. This series of disasters, especially among live stock

at the time, first engendered in Joseph Hughes's mind the ambition to take up a veterinary course.

Consequently, after consultation with the local Dundalk veterinarian, Thomas Drummond, M.R.C.V.S., a Scotch graduate, Hughes went to Glasgow Veterinary College, September, 1879. In the spring of 1882 he received the M.R.C.V.S. The story goes that a number of veterinary students at Glasgow, in the winter of 1881-1882, had gathered together in the rooms of one of them, when the question arose what each was to do after he left college. The question went around the circle till it came to Joseph Hughes. He answered: "I'm going to Chicago to start a veterinary school." Job Johnson, M.R.C.V.S., a junior student at Glasgow at the time, tells the story and vouches for it.

At any rate, in September, 1882, Joseph Hughes left the old country and went direct to Chicago. He did not know a soul in the city, but bore letters of introduction from a few friends he had met *en route* to America. He soon made his way into prominence among the professional men of the city. In the winter of 1882-1883 he divulged his plan to start a veterinary school to Dr. R. J. Withers, a man trained in the English Agricultural School at Cirencester, Glos., and who, having engrafted upon his agricultural knowledge a knowledge of medicine, and having a knack for treating animals, had made a success of veterinary practice. In May, 1883, the prospective school in tangible form was started, with Dr. R. J. Withers as president, Dr. A. H. Baker, a graduate of McGill University, Montreal, as treasurer, and Joseph Hughes as secretary. Dr. Withers was associated with these men in the conduct of this, the Chicago Veterinary College, from 1883 to 1894, when, because of ill-health, Dr. Withers was obliged to relinquish his work, though he did not sever his connection with the school under the charter. He died, I think, in 1903. In 1905 a new charter was granted to the college by the State of Illinois, when Joseph Hughes became president, A. H. Baker retained the office of treasurer, and E. J. McArdle, a brilliant Chicago lawyer, also a Dundalk man, became secretary. These are the directors to-day.

From its inception in 1883 to the present no veterinary college in the United States has been blessed with greater success than the Chicago Veterinary College. The private practitioners

who have graduated from it number several thousands, and they are distributed by scores and hundreds in forty-three of the States of the United States, in five of the provinces of the Dominion of Canada, and in the countries of Latin South America, in which places many of them are eminently successful in all forms of private veterinary practice. It has several hundred men in the United States Government Veterinary Service, and the chief of that service at Washington, Dr. A. D. Melvin, is a Chicago Veterinary College man. The graduates of that school are successful in the United States Army, as State veterinarians, as city veterinarians, as college professors. Its honour roll in these respects is a very large one.

Joseph Hughes, besides being President of the College, is Professor of Veterinary Anatomy, special and comparative, lameness, shoeing, and examination of horses for unsoundness. In the extended period of his connection with the school he has written many articles for *The Breeders' Gazette*, the celebrated American live stock journal, *The Chicago Horseman, The Farmers' Review*, and *The National Live Stock Journal*, which was the predecessor of *The Breeders' Gazette*, as well as published numerous papers which he had previously read before associations and societies. He has done much for the organization of State and national associations. From 1884-1887 (five years) he was secretary of the Illinois State Veterinary Medical Association, and later president of that association and of the Chicago Veterinary Association. He frequently has had to do with the stamping out of contagious diseases in the State of Illinois. The Illinois State University chose him as Professor of Veterinary Science, but he refused the office. He was a vice-president of the Veterinary Section of the International Congress on Tuberculosis, Washington, 1908; chairman of the Executive Committee of the American Veterinary Medical Association, 1909-1910. Before that he was nominated for president of the American Veterinary Medical Association, but withdrew in favour of W. H. Dalrymple. In 1907 he was a member, along with pre-eminent American pathologists and parasitologists, of the United States Special Commission appointed to inquire into certain features of the United States Meat Inspection Regulations; most important of all he was a member of the Commission of the United States Department of Agriculture which formulated

regulations to govern the conduct and standardization of American veterinary colleges.

Surely the young Irishman, who came out to America with the firm resolution to establish a veterinary college in Chicago, builded better than he knew. Life is worth the living when it can be attended with so much success as he has won.

IV.—Albert Hassall, M.R.C.V.S.

In the first two sketches Scotsmen were the subjects; in the third an Irishman. Now we come to an Englishman who has achieved national distinction in America because of his investigations in a field of pure science. Albert Hassall has not endeavoured to make much noise in the world. His forte has been the scientific laboratory; much of his best energy and much of his time has been given to cataloguing scientific works in a definite speciality uninviting to most veterinarians; his renown has been gained without any thought on his part of being in the limelight. He has been a quiet, unobtrusive worker in the capital, Washington, for twenty years—a city where much of the best scientific work of the nation is done, and where the best facilities are to be had for scientific research. Though he has shunned advertisement, his incessant labours in his speciality have made him as noted among scientists interested in medical and veterinary zoology as many another less modest man would be, in less scientific spheres of thought, after the expenditure of much noisy powder by way of advertisement. Hassall is undoubtedly the most noted veterinary zoologist in the United States to-day. There are other veterinarians, like Curtice, who have done remarkable work in veterinary zoology in America. There are other men, not veterinarians, who have written important articles or monographs on some phase of veterinary zoological work. But there is no veterinarian in America so celebrated as Hassall as a veterinary zoologist.

Albert Hassall was born in Plumstead, England, February 12, 1862. He entered the Royal Veterinary College, London, October, 1878, and passed the examinations admitting him to membership in 1880. He came to America in 1886, and engaged in private practice in Baltimore, Maryland. In 1887 he was appointed a veterinarian in the Bureau of Animal Industry,

United States Department of Agriculture, and assigned to work in Maryland, where the bureau was then stamping out contagious pleuro-pneumonia. In 1889 he was appointed Professor of Anatomy in Baltimore University. In 1891 he was ordered to Washington and given an assignment in the zoological laboratory. He was appointed Lecturer on Histology in the National Veterinary College, 1892; Professor of Medical Zoology in the same institution in 1896; and Professor of Medical Zoology in the Veterinary Department of George Washington University, 1898. For the last twenty years, therefore, he has been a Professor of Medical Zoology in Washington and zoological expert for the United States Government in the national laboratories, and for twenty-five years a veterinary official for the American Government.

There are men whose gift seems to direct them to do such work as would best prepare the way for the advancement of scientific investigation by others; there are others who content themselves with doing original scientific investigation only. Hassall is one of those fortunate men who belongs to a class which does successfully both forms of work. Referring to the new genus of trematodes, "Hassalius," Dr. Goldberger, in a recent bulletin of the Marine Hospital and Public Health Service of the United States (No. 71), writes that the genus is "dedicated to Dr. Albert Hassall, to whom, jointly with Professor Stiles, all helminthologists are indebted for that invaluable work, the Index Catalogue of Medical and Veterinary Zoology." This index catalogue is indeed celebrated among zoologists, for it is one of the first things of its kind ever undertaken, especially on so large a scale, and it is largely the work of Hassall. One of the difficulties about scientific investigation is the loss of time and energy occasioned by men repeating, unknowingly, the work others have done better before them. The index catalogue assists in doing away with this waste among zoologists. Its compilation has been an immense undertaking, for the United States Government has already published the 29th part of it, closing the 2,256th page. In it, under the author's name, is recorded some of the work as an original investigator in zoology of Professor Hassall.

But perhaps Professor Hassall's best work has been done jointly with Professor Charles Wardell Stiles, of Washington.

With him he is the author of about fifty articles on zoology, recorded in the index catalogue, many of them the results of original research. It is these, perhaps, which have made his name famous wherever veterinary zoology is studied; and the results of the work have aided in better meat inspection, in a better understanding of what were obscure diseases in animals and man, and the means of prevention. With Professor Stiles, Professor Hassall's name must be joined, not only for the invaluable service both of these scientists have done for zoology in the index catalogue, but, through their original investigations of harmful parasites, what they have done for humanity.

[This interesting series will be concluded in the next issue of THE VETERINARY JOURNAL.]

SEPTIC INFECTION OF THE LATERAL CARTILAGES OF THE HORSE'S FOOT.

By W. STAPLEY, M.D., M.R.C.V.S., D.V.Sc.

Lecturer in Anatomy and Surgery, Veterinary School, Melbourne University.

ALTHOUGH the treatment of quittor has often been discussed, it has not reached that perfection that enables quittor treatment to be regarded either as simple or easy.

Removal of a healthy lateral cartilage is a simple operation; a septic lateral cartilage cannot be removed without the field of operation being infected by the manipulation of the operator. Such interference is only successful when attended by luck; usually the local infection is spread to a wider area—sometimes to the pedal joint, occasionally to a general infection. In every branch of surgery extensive operations in the presence of infection is dangerous. No greater surgical heresy can be taught than that by the use of antiseptics a septic lateral cartilage can be made aseptic. If by the use of antiseptics a quittor could be made aseptic, the necessity for operation would be abolished. With some justice those who employ injections in the treatment of quittor may take exception to this remark; the fact remains that until by injection a near approach to cure is established we are unable to say that the sinus is aseptic. There

Albert Hassall

is an idea amongst some who advocate the removal of the lateral cartilage for quittor treatment, that an infected cartilage never heals until the whole cartilage is destroyed. This idea is based in error.

Providing that a septic lateral cartilage is efficiently drained, reinfection prevented, and the sinuses plugged, it is remarkable how quickly the infection is mastered, and granulation tissue fills in the holes that have resulted from infection necrosis.

The treatment of quittor is the same as the treatment of infection in any part of the body. The first essential is to establish adequate drainage, the second to prevent re-infection.

Both in the interest of the horse owner and of the practitioner quittor cases should be selected for treatment. Cases in which pus has burrowed deeply into the foot behind the cartilage in the vicinity of the pedal joint should not be treated; they bring disappointment to the owner and loss of reputation to the practitioner. Cases for treatment should have the area of sepsis confined to the cartilage and the tissues external to it.

Treatment.—Probes should not be used on quittors; they spread infection and make sinuses where sinuses were non-existent. The hair should be removed from the foot to the knee or hock by clippers, and washed clean in hot salt water. All quittor dressings should be heavy enough to have an osmotic pull towards the dressing. After the foot and limb is cleansed the sinuses of the quittor should be plugged with a paste made of 5 per cent. carbolic acid in glycerine mixed with sulphur, the horn of the foot should be dressed with glycerine, and a gauze dressing soaked in glycerine should be placed over the sinus and the horn forming the covering. This dressing should be left on for 16 hours—from late in the afternoon to the next morning—the time of operation. The object of the glycerine dressing is to soften the horn to enable the hoof to be cut. The vinsol bascule is not suitable for quittor treatment because on subsequent dressings the horse fears it. The English hobbles are clumsy and dangerous; with these we have had two broken backs, and with the vinsol bascule a temporary radial paralysis. The best tackle is Kemp's gear used on a small grass paddock. With this simple apparatus Farrier-Sergeant-Major Boreham, late of the Army Veterinary Corps, casts single-handed heavy draught horses as easily as hacks. Since coming to this school

he constantly laments the fact that in the South African campaign he lacked this simple and safe method of casting. I have tried to trace the use of this gear, and so far I can learn of but one accident that has attended its use—a fractured femur—which happened in the practice of an unqualified man.

With the horse down and secured, a rubber bandage is put on the limb and above it a tourniquet; the rubber bandage is removed and the nerve blocked by endo or paraneural injection of cocaine and adrenalin. As it takes some fifteen minutes for analgesia to be established, the time is best consumed by removing the primary dressing and washing the field of operation with tincture of iodine. The hands are best washed in alcohol. This toilet consumes the time that establishes loss of sensation. With a large curette the outlet of the sinus is enlarged, and the detritus and blood removed with dry sterile gauze. If the rubber bandage has been properly applied and the tourniquet holds, practically no further bleeding occurs. The sinus is traced with a small curette and dead tissue gently removed. At the bottom of the sinus, almost always below the coronary band, the hoof is cut away sufficiently for adequate drainage to be established at the bottom of the sinus through the horn. The coronary band is undisturbed, any healthy tissue blocking the wide mouth of the drain is removed with scalpel and dissecting forceps. Having carefully explored the sinus or sinuses and having established very free drainage, the cavities are plugged with 5 per cent. carbolized glycerine and sulphur, as before operation, and a dry gauze pack is held in place by a string bandage. This outer bandage is soaked in spirits of tar to prevent re-infection and to deter the horse from assaulting it with his teeth. Next day and subsequent days the horse is cast and the sulphur glycerine and carbolic dressing scraped away with curette and wiped off with sterile gauze. On each occasion the sinus cavity is plugged with hot bismuth wax. Under an intelligent application of these methods quittor cases steadily progress to recovery. This method represents no original feature, and all that is claimed for it is that it represents the application of sound surgical principles. They are to cut as much and no more than the case demands, to drain infection, to prevent re-infection, and to use dressings that have attractive properties for discharges. Bier's hyperemic treatment by means of a

tourniquet in our experience aggravates this disease. We have not tried Bier's suction apparatus.

Quittors are troublesome because of defective drainage and sepsis. At all times there is abundant blood in the foot—too much venous blood resulting from the lessened use of the foot—and this condition Bier's treatment aggravates. Unless quittors are very lame we have (under Hunting's suggestion) them exercised, sharing with Hunting the belief that exercise is beneficial to the circulation of the foot. The carbolic glycerine sulphur dressing increases lameness, bismuth wax applied with perfect drainage distinctly relieves it.

SOME NOTES ON THE PASSAGE OF FLUIDS THROUGH THE STOMACHS OF RUMINANTS.

By J. F. CRAIG, M.A., M.R.C.V.S.

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To the classical researches of Flourens and Colin we are indebted for our present knowledge of the physiology of the stomachs of ruminants. Both these investigators showed beyond doubt that all the solid materials pass after the first deglutition from the œsophagus only into the reticulum and the anterior portion of the rumen. From their experiments they also concluded that fluids and semi-solid material were carried in small proportion from the œsophagus directly through the œsophageal groove to the omasum and thence to the abomasum. The experiments on which they based their conclusions were the following:—

(1) Flourens fed a sheep on some roots reduced to a fine pulp, and then immediately afterwards destroyed the animal and made a *post-mortem* examination. He found the pulped roots in large proportion in the rumen and reticulum, but also in appreciable quantity in the omasum and abomasum.

(2) He also made a fistula in connection with each of the four stomachs and found that fluid escaped simultaneously from these openings whenever the ruminant was allowed or forced to drink some liquid.

(3) Colin made a large fistula into the rumen in the left flank of an ox. In order to ascertain where the liquids passed from the œsophagus he inserted his hand through the fistula into the rumen as far as the œsophageal opening. He found that when the animal drank water that the latter entered in greater part into the reticulum and then flowed over into the rumen. Placing his finger in contact with the lips of the œsophageal groove he found them lightly drawn together, and felt a very small quantity of fluid trickle directly through the groove from the œsophagus into the omasum. This experiment he repeated in several oxen with the same result.

The chief objections to the conclusions drawn from these experiments are: Nos. 1 and 2 do not show that any fluids pass into the third and fourth stomachs through the œsophageal groove without mixing with the contents of the rumen and reticulum. To No. 3 it may be objected that the manipulation altered the normal physiological function of the stomachs and of the œsophageal groove.

Investigations in later years have been made with water tinted with some colouring agent, such as magenta or fuchsin. These fluids have been administered in various ways; in drench, by probang, and with the animal standing or placed on its haunches and the head held back. Immediately after the water was administered the animal was killed and the contents of the stomachs examined.

Vryburg administered two or three litres of water, deeply coloured with fuchsin, by a stomach pump to four adult oxen. The drenching was carried out with the animals in the standing position and the long axis of the head kept horizontal. To two heifers at the Royal Veterinary College of Ireland half a gallon of water, deeply coloured with fuchsin, was given with the ordinary drenching horn; and to a bullock a similar amount of coloured water was administered by probang. A two-year-old bullock was first allowed a bucket of water and then drenched with two quarts of water coloured with magenta. A goat was given a drench of half a pint of water coloured with magenta. During drenching the latter animal was placed on its haunches and the head held back. The animals were destroyed almost immediately after the material was administered and an examination made of the stomachs. In all cases the colouring agent was

found only in the rumen and the reticulum; not a trace had penetrated into the omasum and abomasum. The stain had diffused through the contents of the reticulum, but in the rumen it was present only in the solid food near the walls of the organ.

It might be objected to these experiments that they do not represent what takes place when the ruminant drinks voluntarily of water or the other fluids. At least, however, they show what occurs when medicinal or other agents are given in the form of a drench. These agents are diluted by the contents of the rumen and reticulum before they reach the omasum and abomasum.

Passage of Fluids from the First Two Stomachs into the Omasum and Abomasum.

After a variable period the fluids pass from the rumen and reticulum into the third and fourth stomachs, probably by way of the opening in the reticulum. Vryburg allowed a cow to drink a litre of coloured water and then destroyed it half an hour afterwards. He found the greater part of the fluid in the rumen, but a small quantity had entered the third stomach and stained the upper portion of the leaves of this compartment. The same result was also obtained on killing a heifer which had been given two litres of coloured water by means of an irrigator, half an hour previously. Three other adult cattle were destroyed, seven, eight, and ten hours after the administration of fuchsin solution. In the first case a little of the coloured solution had penetrated into the third stomach; in the second case the contents of the third and fourth stomachs were stained red, but the pylorus was not coloured; in the third case a small quantity of fuchsin had reached the pylorus and entered the duodenum. At the R.V.C.I. a goat was drenched with half a pint of water coloured with magenta and containing 10 gr. of strychnine, and died twenty-five minutes afterwards. The colouring matter was found in the rumen, reticulum, omasum, and at the entrance to the abomasum.

Absorption from the Stomachs of Ruminants.

The mucous membrane of the first three stomachs is similar to that of the mouth. The epithelium is thick, squamous and stratified, and not well adapted for the purposes of absorption.

The fourth stomach is the true stomach of the ox. In the last experiment in the goat, symptoms of strychnine poisoning appeared in about twenty minutes after administration. Probably in that time some of the material had reached the abomasum and was absorbed.

Secretions from the Stomachs of Ruminants.

I have examined numerous sections of the walls of the first three stomachs and have never seen any glands in them. It is said that a few small mucous glands are present in certain portions of the rumen. These glands, if present, cannot however have much effect in increasing the fluid condition of the contents or lubricating their passage. The consistence of the ingesta depends upon the amount of fluid taken in by the mouth as such, or with food, and of the saliva swallowed.

Practical Deductions.

(1) Since all fluids taken in by the mouth must be diluted by the contents of the rumen and reticulum, this dilution may interfere with the action of various medicinal agents in certain cases. This may account for the unsatisfactory results obtained in the treatment of parasitic abomasitis. It might, therefore, be advantageous in these instances to inject the vermicides directly into the abomasum through the abdominal wall. The guide line for this operation is the line of right asternal costal cartilages. The abomasum may be punctured in the ox immediately behind this line at any point within a foot of the xiphoid cartilage of the sternum.

(2) Where the contents of the first three stomachs are abnormally dry, they may be softened, chiefly by water taken in by the mouth or by increasing the amount of saliva secreted and swallowed. The removal of the ingesta is effected by the muscular contractions of their walls. Purgatives, such as magnesium sulphate, act for the most part on the intestines. They stimulate the passage of fluids into the lumen of the bowel by increasing osmosis, and the secretion of the intestinal glands. The mechanical distension of the gut with fluid provokes slight peristalsis. This increased peristalsis may be transmitted thence to the first three stomachs, and perhaps some of the fluid in the bowel

may be carried forward to dilute the contents of the omasum, reticulum, and rumen. Stimulants to the muscle fibres are of the greatest service in producing the desired effect upon these organs. Thus it is that such agents as the strychnine preparations, nux vomica, and the ammonia compounds prove very useful adjuncts to laxatives in cattle. It may be truly said that the combination of stimulants with a moderate dose of laxative will effect what a strong purgative of, say, Epsom salts, fails to produce upon the stomachs of ruminants.

AN INFECTIOUS FOOT DISEASE IN SHEEP.

By Dr. A. THEILER, C.M.G.

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In May, 1910, we received from J. P. Meyer, Esq., of Rietvlei, near Johannesburg, two feet of sheep with the information that he had been experiencing a lot of lameness among his sheep, which in some instances became so serious that he had to kill the affected animals.

The two specimens were referred to as No. 1 (coming from a case which had been in existence for a year) and No. 2 (from a case of a month's duration) respectively. Mr. Meyer stated that the disease commenced above the hoof and finally invaded the hoof itself.

The specimens were examined and the following notes were taken:—

Specimen No. 1 showed pronounced deformation in length and growth of the horn of the foot, probably due to an affection of the matrix. The matrix of the coronary band showed ulcers and a thick growth of fibrous tissue. It was apparently a sequel to case No. 2.

Specimen No. 2.—The skin of the coronary band was covered with a blood-stained, dry crustation and free from hairs; the matrix of the coronary band was thickened and tumified. The deformation of the horn was just commencing.

The microscopical examination proved the absence of the necrosis bacillus which was suspected to be present, but bacteria of different species were noted.

The cases were diagnosed as an inflammation of the skin, probably of an infectious nature. No definite opinion could be given as to the cause of the disease itself, although it was expected that some micro-organisms would be responsible for the inflammatory process.

In order to trace these organisms fresh cases would be required, so that the necessary experiments could be undertaken with living material.

Accordingly Mr. Meyer was asked by us to send a living sheep to the laboratory, to which request he willingly complied, and forwarded us an affected sheep, which arrived here on June 25, 1910. The description of the case was as follows:—

Sheep, Persian, No. 2763.—Lame on near front leg. There was an ulcerating wound in the coronary band, and on pressure a white pus appeared on several places in and on the border of the wound. The horn below the ulcer was loose, and it was found that the ulcer penetrated into the matrix of the lateral hoof wall, reaching almost as far as the sole. On the coronary band of the off hind food was also an ulcerating wound limited to the coronary band and about the size of a sixpence. It was covered with a crust, on the margin of which pus escaped on pressure. Accordingly we probably had to deal with the same affection on both places, a first and initial one on the off hind foot and an advanced one on the near front foot.

This sheep was kept under observation and, with the exception of an aseptic bandage, no treatment was applied. The object was to find out whether the affection which was observed on the Persian sheep could be transmitted to other sheep by inoculation, and, if such should be the case, whether any specific organism could be found which, when inoculated into healthy sheep, would produce the same lesions.

On July 12, 1910, two sheep, Persian (one not numbered, the other marked with red paint), were scarified superficially on the coronary band of the near fore foot with pus collected from an ulcer on sheep No. 2763.

Persian sheep No. 2234 and No. 2168 were scarified between the claws of the near hind foot, and the same material was placed on the superficial wound. All the feet were then bandaged with an aseptic linen bandage in order to prevent any outside contamination.

Two days later the examination of the feet revealed the presence of a swelling, hot and painful. There was a crust on the place of operation on the "red paint" sheep and on sheep No. 2234. In the unnumbered sheep and sheep No. 2168 the place of operation was tumified, and on pressure small drops of pus escaped on several places where the scarification had been made.

On July 14, 1910, the "red paint" sheep and sheep No. 2234 showed a wound with a superficial necrosis. The "no number" sheep and sheep No. 2168 were discharging pus on pressure.

On July 15, 1910, sheep No. 2234 had a superficial ulcer between the claws, about the size of a sixpence in circumference, with a yellow deposit on its surface.

Sheep No. 2168.—The place of operation was much swollen and very painful, and on pressure pus escaped at several places.

"*No number*" *Sheep*.—The wound between the claw reached about the size of a sixpence in circumference, and was discharging pus very freely.

"*Red paint*" *Sheep*.—The place was much swollen and painful, and on pressure pus and blood escaped.

In the course of the following days all the wounds sloughed the skin and an open ulcer appeared, discharging pus.

In order to prove the infectiousness of the discharged pus in the wounds of the foot for other parts of the skin, it was decided to smear the pus on to the scarified wounds on the forehead. Each sheep was treated with its own pus. In the course of the next few days the same symptoms were noted on the head, viz., a painful swelling, first with blisters of the surroundings and redness, painful when touched, and the formation of pus, which on pressure escaped, and finally sloughing of the skin on the seat of operation as far as the inflammation had formed an abscess.

There was accordingly no doubt that the cause of the ulcerating wound was due to a virus which propagated when transplanted into the skin. It remained to isolate the organism to obtain it in a pure state, and then again to transplant it in order to produce the same lesions as described beforehand.

The Micro-organism.—When the pus of the original sheep (but particularly that of the inoculated one) was spread out in a smear preparation and stained in the usual way, a small bacterium could be seen to be present in great numbers, but there were also other bacteria present, viz., cocci. When the Gram method

was applied, the small bacterium took the black stain, and by this means its size and numbers could easily be traced. Pus of the inoculated sheep was spread on the slanting surface of a Martin agar tube, when, after a day or two, transparent droplets appeared, growing not larger in size than about that of a pin's head. The droplet was transplanted on to a new tube of slanting agar, and, by means of the condensed water present, spread all over the surface. Over this a thin transparent film grew, but never developed into any thick layer; it remained practically stationary after it had grown into the film. The film consisted of a dense aggregation of very fine droplets. When this culture was examined under the microscope it proved to consist of the above-described bacterium in a pure state.

Transplantations were made on different media, but there was no improvement in the growth observed in the originally used Bouillon-Martin-Agar.

In order to obtain sufficient culture material for inoculation purposes, bouillon was added to the slanting agar containing the growth, which was then detached and developed freely in the liquid. The emulsion was then applied to the scarified surface on the skin of the coronary band, similar to the original transplantation, but out of four sheep only one developed a typical ulcer. It is very likely that the material in emulsion form was not viscid enough to adhere in the wound. Accordingly it was decided to inject a few drops of the culture emulsion into the skin of the forehead of the sheep. The place of injection was shaved and disinfected, as was done in the case of a control sheep, which was, however, not injected. On the place of the injection a swelling appeared in the inoculated sheep with an inflammation of the skin, the swelling rising above the surroundings and reaching about the size of a hazel nut. The swelling burst in the course of the next few days, and a sanguinolent pus escaped when slight pressure was applied. Then an ulcer developed, discharging pus, which gradually healed up.

The microscopical examination again revealed the presence of the typical bacterium abounding in pure culture. The control sheep did not show any reaction. Thus it appears that the bacterium is responsible for the formation of this ulcerating disease, which, accordingly, need not necessarily be limited to the coronary band of the foot, although that part represents possibly

the seat of predilection, probably because wounds frequently occur there.

A disease of sheep, known as "foot-rot," is sometimes very frequently met with in rainy weather on wet places. It must also be due to some organism which, under the above-mentioned conditions, finds its best chance to enter into the skin of the foot and to develop there. It remains yet to be seen whether the bacterium just described is also responsible for that affection.

Treatment.—The foot evil described does not require any specific treatment except one which applies to all ulcerating wounds, viz., thorough cleaning of the wound, preferably by means of warm water and a disinfectant, such as carbolic acid, 3 per cent.; Pearson's antiseptic, 3 per cent., &c., and a dressing of the wound by means of a disinfecting and astringent ointment. A cheap and effective ointment can be made as follows:—

Powdered bluestone, 10 parts; fat, 70 parts; Stockholm tar, 5 parts.

When the ulcer has penetrated into the matrix of the hoof and the horn becomes detached, it is advisable to cut it away and to clean and dress the wound underneath, as mentioned before. When a luxuriant growth or unhealthy granulation develops cauterizing with nitrate of silver can be recommended. It is sometimes noticed that although the wounds have healed perfectly there remains a tenderness on the feet, the sheep still going lame. This will probably disappear when the horn has grown over the wound in the hoof.

SOME *POST-MORTEM* ALTERATIONS OF MEAT.*

By J. B. BUXTON, M.R.C.V.S., D.V.H.

Barnet.

MEAT may undergo a variety of alterations from the time the animal is slaughtered until its preparation for the table.

Let us first consider those alterations which may be said to be due to direct contamination.

As may be readily appreciated by visiting any abattoir during or immediately after slaughter, the risks run by meat of con-

* Paper read at the Birkenhead Congress of the Royal Institute of Public Health.

tamination are very numerous; indeed, it seems wonderful how it can escape.

Frequently the contamination is the result of careless handling, or due to soiling with bile or the intestinal contents. It sometimes happens that in excising abscesses, morbid growths, or areas which have undergone pathological alterations, the surrounding tissue becomes contaminated, although in some cases such an area may be cleansed, yet where the meat has become contaminated with the contents of the intestine or an abscess, mere washing is not sufficient to restore its normal character, since the bacteria which have found their way to the meat are not thereby removed; indeed, the moisture furnishes favourable conditions for their multiplication. In such a case the only safe remedy is to remove the infected surfaces with a knife.

Meat may become contaminated with the larvæ of dipterous insects during the summer months. As to whether their presence indicates long standing decomposition or not is a question which frequently confronts a meat inspector. As a reply, Ostertag states as follows: "Among the flies, the larvæ of which develop in animal material, the house-fly (*Musca domestica*), the blow-fly (*M. vomitoria*), and the flesh-fly (*Sarcophaga carnaria*), may be mentioned. The first two mentioned flies deposit their ova in fresh and decomposing materials of animal origin, and the larvæ hatch within twenty-four hours; while the flesh-fly deposits living larvæ in decomposing material. It therefore appears that the mere demonstration of dipterous larvæ is no proof that the material has been long undergoing the process of decomposition. The length of the larvæ, which varies from 1 mm. on the first day to 10 mm. on the eighth to tenth day, may give an approximate indication of the length of the period of decomposition."

Meat, during its preparation or preservation, may absorb injurious metals. There is, for instance, a case on record of poisoning as a result of eating meat which had been roasted on a spit over a fire composed of wood which had been painted with white lead. Chronic cases of lead poisoning have been seen due to pieces of that metal which had become loosened from badly made mincing machines. Ungar has demonstrated that in tinned meat there is a possibility of enough metal being absorbed to be injurious to health.

Meat may also undergo *post-mortem* alterations in its odour

due to the fact that it is capable of absorbing and retaining odours. It is well known that meat absorbs the combustion products of tobacco smoke. The meat of a pig that had been carried a considerable way in a van disinfected with carbolic acid developed a very considerable odour when boiled or roasted. This, and many similar cases, serve as a warning against conveying meat in odorous vehicles, and also against the use of odorous disinfectants in abattoirs. Cold storage plants should also be free from any high-smelling materials.

An important *post-mortem* alteration of meat is acid fermentation. This occurs in all musculature and the liver. Eber distinguished normal, simple acid fermentation, and abnormal, stinking acid fermentation. The former condition occurs in meat at the time of the appearance of *rigor mortis*. According to Eber, the cessation of rigor is ushered in with processes which, according to the prevailing idea of the matter, are of an acid nature. The meat acquires a peculiar agreeable flavour as a result of this acid fermentation, known as ripening. Later, after about three weeks or even more, traces of H_2S appear. The liver shows typical acid fermentation. When freshly excised it has an alkaline reaction. After twenty-four hours the reaction is slightly acid, and after two to three days small foci of a yellow colour appear in the parenchyma. These areas increase in size, and after eight to fourteen days the liver colour is lost, and the organ becomes yellow. Some authorities consider that acid livers are not in any way injurious, and are really nothing more than "ripened livers."

Stinking acid fermentation, according to Eber, differs from the former. It is frequently seen in the meat of game which has been stored while in a warm condition or has been "heated." The hair is easily detached, the sub-cutis shows a green colour, the musculature is copper red, while its cut surfaces are greyish or dark green. The odour of freshly-cut surfaces resembles that of decomposition, and is increased upon the addition of acid. The reaction is acid, and NH_3 is absent, while H_2S may be demonstrated in large quantities. The flesh of the ordinary food animals shows this peculiar alteration when stored under such conditions that it is unable to cool, and is termed "suffocated."

Those *post-mortem* alterations which concern us most are due to the localizations of micro-organisms on meat. Owing to

its peculiar chemical composition meat is an excellent medium for fungi of all kinds. The localization of fungi is most likely to occur when the meat possesses a high moisture content due to improper preservation. The red and blue coloration of meat due to *Bacillus prodigiosus* and *Bacillus cyanogenes*, and mouldiness due to *Penicillium glaucum* or *Mucor mucedo*, are only of slight importance, as they usually cause no injury to health. In the latter case, however, the flesh, if it be not in the dried condition, is usually putrid, and for this reason should be seized. In dried flesh the same severity is not necessary. The greater part of these surface growths can be removed by scraping, and cooking destroys what remains. Red sardines have been found to be harmful, the colour being due it was supposed to a toxic variety of *B. prodigiosus*.

The peculiar grey coloration at the periphery of sausages which have been kept some while is not well understood. *B. mesentericus* has been credited with causing it. Some attribute it to a loss of salt as a result of endosmotic processes, as much as 3 per cent. less salt having been found in the periphery than in the interior. According to Glaze, volatile sulphur compounds are concerned in the coloration. The latent green coloration in poorly salted hams and pickled meat, which appears only after exposure to oxygen, is due to the action of H_2S.

Fat shows a peculiar alteration known as rancidity. This was supposed at one time to be due to the appearance of free fatty acids, and the degree of rancidity was estimated by the amount of acid present. It has since been shown, however, that an aldehyde is responsible for the rancidity. Its presence may be shown by collecting the distillate obtained by means of steam, in a hydrochloric acid metaphenylene diamine solution, the degree of rancidity being estimated colorimetrically by the yellow coloration. We have already seen that the *post-mortem* alterations which concern us most are those which are due to the localizations of micro-organisms on meat, and of these by far the most important are those due to the localization of the bacteria of decomposition. These thrive, perhaps, the best of any on meat, but their development may be checked by allowing the meat to cool thoroughly and by preserving it in cold storage, thus retaining its fresh condition for a certain period. When, however, the meat is not cooled properly, or is heaped together while still

warm, or kept in close or badly-ventilated rooms, it becomes a nutrient medium for putrefactive organisms. The extreme danger of eating decomposed meat, even when it has become so after cooking, is shown by the numerous and often serious cases of so-called sausage poisoning, vomiting after eating "high" ham, "high" game, and badly preserved pieces of meat. There are many organisms concerned in the putrefaction of proteid, but perhaps the most important species is *Proteus vulgaris*. In addition to those which liquefy gelatine, Kraus found in decomposing meat five non-liquefying species, one of which closely resembled the *B. enteritidis* of Gaertner. *B. mesentericus*, which is non-pathogenic, but causes decomposition, is found in almost all sausages. Wolff isolated from meat which had caused an outbreak of poisoning, a non-motile organism 1-1.5 micron × .4 micron, Gram +, producing a brush-like growth in gelatine, and growing rapidly on meat, producing an odour of ammonia. Raw or boiled infected meat broth is pathogenic for dogs, causing violent diarrhœa. It was called the *B. celluliformans*.

Putrefaction begins in the parts of the meat exposed to the air, and gradually penetrates into the interior. In "fevered" flesh putrefaction sets in earlier, and penetrates into the deeper parts more quickly. In the case of animals which were not eviscerated at once, superficial and deep putrefaction occur simultaneously and very early. This is due to the fact that the meat contains more blood, and that the putrefactive organisms have penetrated from the intestines into the neighbouring venous trunks. In the case of animals which have died a natural death there is a marked production of gas in the deep putrefaction owing to the fact that not only aerobic, but also anaerobic gas-producing organisms penetrate the blood. In small animals, such as hares and birds, the intestines may be left intact, without bad results, because the small animal bodies cool rapidly, preventing the growth of cadaveric bacteria. Calves in Norway before there was any official meat inspection were allowed to remain uneviscerated until the abdominal muscles and kidneys became discoloured and stinking. Nielsen reports that the foreparts of a calf so treated were eaten without bad results, while the consumption of the parts in contact with the alimentary canal caused serious cases of illness, whether eaten boiled or roasted. Nielsen endeavoured to discover whether, and under what con-

ditions during the decomposition of animal proteids, poisonous decomposition products of the group of albumoses soluble in water were formed. During his investigations he found that when only a limited amount of air was admitted, albumoses showing toxic action when injected subcutaneously did not appear on the fifteenth day, while when air was admitted, albumoses with very poisonous properties developed in meat which was five days old.

The bacteria of putrefaction are typical obligatory saprophytes. They are found only on dead parts, which are in connection with the outside world, and not in the blood. They may produce acute symptoms of poisoning, because they possess the power of producing poisonous substances. With regard to the essential nature of these poisonous metabolic products, the prevailing view until recent years was that they were crystalline bodies. Brieger isolated numerous crystalline putrefactive products, which, in accord with Selmi, he characterized as ptomaines. To this group belong muscarin, cholin, cadavarin, putrescin, neurin, neuridin, saprin, &c. In 1885 Vaughan isolated tyrotoxicon from poisonous cheese, and since then these bodies have been recognized as the products of the activity of micro-organisms. Chemically they are mostly bodies of comparatively simple constitution, closely allied to ammonia and its derivatives. In the report of his experiments of obtaining ptomaines from decomposing fish, Brocklish states, "The most poisonous properties are possessed by the extraction fluid freshly obtained from putrefactive broth. During the process of obtaining the bases, the toxicity of the extract is more and more diminished, until it sometimes disappears altogether." It is now thought that not only with putrefactive organisms, but also with pathogenic bacteria, it is not so much the crystalline as the amorphous metabolic products which represent the active poisonous bodies. These decomposition toxins, as they are called, according to Scholl, are not completely destroyed until after subjection to a temperature of 100° C. for one and a half hours. Niemann found that the toxins which arise during decomposition persist in the meat for a short time in a very virulent condition, but soon disappear on account of further decomposition. It has, therefore, been recommended that decomposing material which is to be investigated should be placed immediately in absolute alcohol, as

in it the toxin will remain for some time in an unaltered condition. The alcoholic extract is then evaporated, and the residue dissolved in water. Subcutaneous injections of 1.2 c.c. of this aqueous solution will kill guinea-pigs and rabbits if virulent decomposition products are present. Besides toxic elements, decomposition bacteria produce aromatic substances and fatty acids, mercaptan, ammonia, and phenol. The presence of putrefaction may be shown by the presence of ammonia. The tests employed for the demonstration of ammonia are of use, since the characteristic odour of putrid meat may not be very pronounced, and in many cases may be almost absent; further, the alterations in colour—grey to greenish-black, due to the formation of sulphide of iron and consistency, it becoming softer and more fluid than normal—are not always conspicuously present. Although decomposing flesh is alkaline, owing to the presence of NH_3, alkalinity does not hasten decomposition; this is obvious, since in addition to fresh organs, blood also, and lymph extravasations, as well as pickled meat and smoked hams, may possess an alkaline reaction. Moreover, the reaction of decomposing substances varies; an acid reaction, an amphoteric reaction, or an alkaline reaction may be present. The last is, however, the most common one met with in putrid meat. Eber accordingly proposed an objective method of investigation, based on the demonstration of free ammonia. A small quantity of the following reagent is placed in a test-tube, viz., one part pure HCl, three parts alcohol, and one part ether, which is then corked and shaken. A small quantity of the suspected material is made to adhere to a clear glass rod, which is quickly dipped into the test-tube; so that its lower end is about ¼ in. above the fluid, care being taken that it does not touch the sides of the tube. If NH_3 be present, a cloudiness appears, which sinks down at the end of the glass rod, or surrounds it. The more advanced the stage of putrefaction, the more intense the reaction; so that in a bad case it may even become precipitated as a white layer on the walls.

This method cannot be considered as proving infallibly the presence or absence of decomposition, as it may possibly give a positive result in healthy meat, such as mutton, pickled meat, &c., due to the frequent presence of trimethylamine, but taken in conjunction with other phenomena of decomposition it is decidedly

useful. The means of detecting putrefactive changes in canned meat are of great practical value, on account of the numerous cases of poisoning which occur after the consumption of such food material. The ends of the cans in the case of well-preserved meat should be depressed owing to the condensation of the steam after the cans are soldered. If the contents are badly cooked and subsequently become decomposed, the ends bulge, due to the pressure exerted by the gases of decomposition. Unscrupulous manufacturers boil the tins a second time, but a second hole has to be bored and afterwards soldered. Tins which have been treated in this way should therefore be condemned just as readily as though the ends were bulging outwards. On opening decomposing cans one finds that the gelatine is discoloured and liquefied. Van Ermengen is of opinion that decomposition is of but slight importance in the ætiology of cases of sickness after eating meat, and bases this statement upon the fact that decomposing fish serves as a delicacy for 300,000,000 Indians, Indo-Chinese, Malays, Polynesians, and negroes of all kinds. Forster points out that among these people decomposing fish, like the pungent cheese of the European table, is used as a condimental addition to rice, and states that we know nothing of the decomposition processes taking place in this and similar food materials, as for example, the fermented eggs of the Chinese.

Phosphorescent rays are sometimes given off from dead meat, whether cooked or raw. This is seen in dark rooms and at night and is due to the presence of phosphorus brought about by certain organisms. The luminous appearance becomes visible in about forty-eight hours, and persists for about eight days, if the flesh does not become putrid. As soon as decomposition sets in the phosphorescence is lost. The best known organisms causing phosphorescence in meat are the *Micrococcus pflugeri* and the *Photobacterium sarcophilium.* The former is a micrococcus measuring about 1 micron in diameter, the latter a short bacillus measuring from 1 to 1.5 micron in length. The luminous phenomena are most active when the flesh is kept at a temperature slightly below 20° C., but it may still be seen at 3° C., or even lower, but begins to disappear above 30° C. This peculiar power acquired by meat of emitting light was noted as far back as 1592 in Rome, where part of a slaughtered lamb became luminous. Musch, in Basle, in 1877, observed that pork which was kept in a receptacle in a pantry, emitted a green light of such

intensity that people were able to recognize each other by it, and to read the time by their watches. Recently many reports have been published concerning similar cases. The following phosphorescent organisms have been demonstrated in sea-water —*Photobacterium phosphorescens*, on salt water fish in general, *P. fischeri*, *P. balticum* (Baltic), *P. indicum* (West Indian Ocean), *P. luminosum* (North Sea). Ludwig demonstrated that *P. pflugeri*, which was found on haddock, could be transmitted to beef, mutton, pork, &c. For destroying phosphorescence it is recommended that the meat be treated with salicylic acid or acetic acid.

Some Methods of Preservation.

One essential condition for the good keeping property of wholesome meat is a careful cooling immediately after slaughter, since the animal temperature is the optimum for the growth of putrefactive bacteria. By the application of so-called preserving agents, it is possible to increase the normal keeping power of meat. These preserving agents are either chemical—generally used in meat preparations—or physical, most commonly used for unprepared meat. Experiments have been made in the preservation of meat in sterile air on board some ships, but apparently with but little success. Emmerich's method of eviscerating and cutting up animals with sterile knives and leaving the skin intact, and covering the cut surfaces with glacial acetic acid, finally packing the joints in sawdust which has been saturated with sodium chloride solution, and dried at 100° C., has been employed. The common methods of preserving meat are salting and pickling. Common salt is used in the preservation of bacon sides, hams, and meat, especially in America and Australia, where large quantities of salt meat are exported. It is either rubbed into the pieces of meat in a dry state (salting), or applied in the form of a salt brine (pickling). Brine syringes were introduced; these have a long needle, through which the brine is injected into the connective tissue between the bones and muscles. By this means it is possible in a short time to thoroughly impregnate large pieces of meat, whereas merely laying it in salt brine would not have the same effect. In large meat-salting establishments brine pumps are used; these are made on the principle of ordinary force pumps. Another method is to pickle in iron tanks, from which the air has been ex-

hausted; it is claimed that this method is much quicker and more uniform than the old process. Pickling by means of the circulatory system has also been tried. The animals are killed by shooting. Pigs are scraped in the usual manner, and then placed on their backs on a trough table, so that the blood may run off. The thoracic cavity is opened and a canula introduced through the left ventricle into the aorta, a pump is then connected, and the right side of the heart opened. The brine is then pumped through the circulatory system, forcing the blood out through the right side of the heart. The process requires about four seconds. After being cut up and allowed to cool the meat is ready for export or smoking. In South America rapid pickling has been tried by passing an electric current through the meat while lying in the brine. The preserving action of brine depends upon the drying effect as the result of the extraction of water. Moreover, sodium chloride has slight disinfecting properties, which consist in a general check upon the multiplication of organisms. Putrefactive bacteria are much more susceptible to the action of salt than are cocci. In general the growth of bacilli is checked by a 10 per cent. solution of sodium chloride; some, however, endure a concentration of 12 per cent. or 15 per cent. in pure cultures in bouillon.

Brine is usually composed of 1 part of saltpetre to 32 parts of common salt, and 2 parts of sugar. Saltpetre is added in order to prevent the discoloration of the musculature caused by salt. The sugar is added on account of its hindering putrefaction; it may, however, cause a slimy fermentation of the brine, which is said to be without effect upon the character of the pickling material.

Smoking, as a method of preserving meat, has been in use possibly longer than any other method. There are two methods employed, slow, and rapid, or hot smoking—the former being the more common. The meat is smoked slowly for several days at about 25° C. Wood only is used, juniper bushes, beech chips with juniper berries, tan bark with mahogany chips, and other waste material from hard wood. Fir chips are avoided on account of the objectionable flavour which they impart to the meat. The preserving action of smoke depends upon the drying effect due to the heat, and also upon the disinfecting properties of the smoke.

Preservation by heat is a good method, and one which is

extensively used. "Corned" beef is treated in this way. The meat is pickled and then boiled thoroughly, spread out on large tables, sorted and packed. The tins are placed in boiling water for from three to six hours, according to their size, they are punctured while hot, to permit the escape of superfluous fat or air, soldered, and again boiled for a few hours.

In South America, South Russia, Roumania, and many other countries meat is cut into strips and dried in air before being consumed; it is dipped into water in order to soften it, or boiled.

Preservation by cold is by far the best method of preserving meat. It causes no alteration in either the taste or the nutritive value, and improves the quality of the meat considerably. Under the prolonged action of sarcolactic acid the meat acquires an unusually tender, soft character. The effectiveness of cold is almost unlimited. The Jakutes still feed their dogs on the meat of mammoths, which have been for thousands of years in the ice of the Lena.

The action of cold does not destroy the putrefactive organisms, but it prevents their multiplication, and may keep them dormant and prevent the development of their proteolytic power. Two methods of preserving meat by means of cold are employed, namely, freezing, and subjecting to a temperature slightly above 0° C. Meat may be kept indefinitely by freezing, but when preserved in this manner, water vapour and putrefactive bacteria may be deposited upon the surface of the meat, and so greatly affect its keeping property when it is thawed out. Freezing is, however, essential in trans-oceanic traffic in meat, while it does not adapt itself to inland trade. In the latter case the best method is to keep the meat at 3° to 5° C., in chambers with an average moisture content of 70 per cent. to 75 per cent., but even under these conditions putrefactive organisms may show a slight growth; it is therefore essential to dry the surface of the meat and keep it so. Under these conditions it will remain undecomposed for several weeks.

The preservation of meat by means of boric, sulphurous, and salicylic acids is but little employed, at least in this country, and is, therefore, of but slight importance. The Swiss and German Governments have prohibited the use of chemical agents in the preservation of meat and meat products, with the exception of salt and saltpetre.

Clinical Articles.

STRANGLES, COMPLICATED BY PURPURA HÆMORRHAGICA, TREATED WITH STRANGLINE.

By Captain A. J. WILLIAMS, F.R.C.V.S., A.V.C.

Mounted Infantry School, Longmoor.

Subject.—A Mounted Infantry cob, age 5 years.

History, &c.—Admitted for treatment on September 4, 1910, showing the usual symptoms of strangles, a submaxillary abscess developing. Isolated and usual treatment.

September 9, 1910.—Strangline 1 c.c. injected.

September 10, 1910.—Submaxillary abscess opened.

September 16, 1910.—Symptoms of purpura hæmorrhagica present this morning, few petechiæ on the nasal mucous membrane, legs swollen in characteristic manner, breast much swollen, swellings hard, hot and painful. Animal bright and feeding. Pot. chlor. ʒiv. in drinking water three times a day, pot. iod. and quinine āā ʒiiss. in bolus three times a day.

September 18, 1910.—Lips and nostrils swollen, swellings in legs a little less, swelling on breast dropsical. Feeding well, and bright.

September 21, 1910.—Increased swelling in both hind legs. Pot. iod. and pot. chlor. continued and strangline 5 c.c. injected.

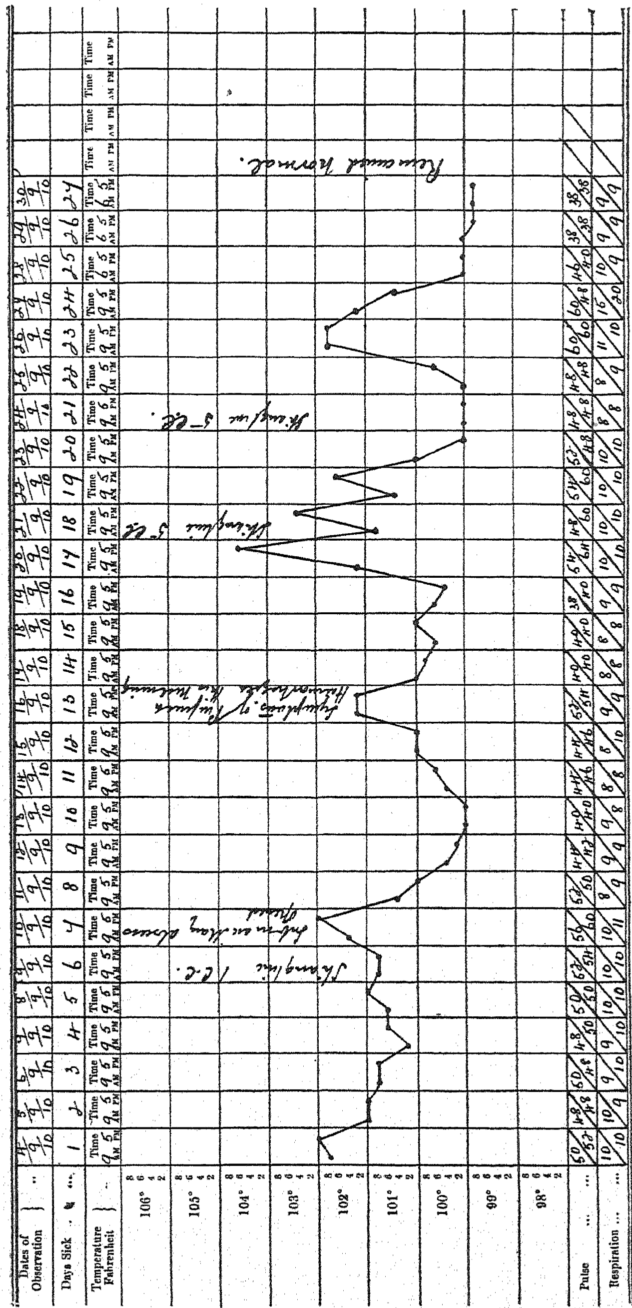
September 22, 1910.—Swellings much less in legs and nearly gone from the lips and nostrils.

September 24, 1910.—Swelling nearly gone from both fore and near hind; off-hind still enlarged; petechiæ on nasal mucous membrane very faint. Strangline 5 c.c. injected.

September 30, 1910.—The swellings quickly disappeared after the last injection of strangline. There was a large reaction, swelling down to the shoulder and under the breast, but it has practically gone now.

October 14, 1910.—Discharged cured, to light duty.

Remarks.—Purpura hæmorrhagica usually occurs during a severe attack of a debilitating disease, when the vitality is much lowered and the disease protracted. In this case the attack of strangles was a mild one and running a normal course when the complication suddenly manifested itself.



Captain Williams's Case of Strangles and Purpura.

At the time this case occurred, strangline (see VETERINARY JOURNAL, August, 1910) was being tried for the treatment of strangles. There was marked improvement after the first injection of 5 c.c., and all signs of the disease quickly disappeared after the second injection. This was very satisfactory, as up to the time strangline was used the case was making little progress. It appears to have had a bactericidal action on the organism in this case.

TWO CASES OF PARAPLEGIA.

By CAPTAIN A. J. WILLIAMS, F.R.C.V.S., A.V.C.

Mounted Infantry School, Longmoor.

CASE I.

Symptoms.—A Mounted Infantry cob, age 15 years.

History, &c.—*January* 21, 1911.—The animal had a hard day yesterday. When being led to water this morning, at 7 a.m., she was noticed rolling in gait.

Symptoms.—Inco-ordinate movements, crosses hind legs, catches toes of fore feet against the ground, worse at a trot and when turning, nervous expression, eyes staring and bulging. When blindfolded symptoms increased, plaits hind legs, tends to fall backwards, moves to off side and can only get along with difficulty. Aloes ʒiv. given, pot. iod. and pot. brom. ʒi. twice daily.

March 30, 1911.—Moving much better. Turned into a paddock during the day. Pot. iod. ʒi. and Pulv. nucis vom. ʒi. twice daily.

April 7, 1911.—Paraplegic symptoms still marked.

April 23, 1911.—In a very bad state; has difficulty in keeping her feet.

April 26, 1911.—Destroyed by venesection, under chloroform.

Post-mortem appearances.—Brain congested, an organized blood-clot in the region of the fourth ventricle. The spinal cord in the lumbar region showed hæmorrhage into the grey matter, section normal in consistency

CASE 2.

Subject.—A Mounted Infantry cob, age 16 years.

History, &c.—*February* 8, 1911.—When brought out of the stable this morning she was noticed rolling about. Marked paraplegic gait, plaits hind legs; worse at a trot and on turning. Pot. iod. and Pulv. nucis vom. ʒi. of each was given twice daily.

March 8, 1911.—No change. Treatment continued.

March 22, 1911.—About the same. Medicine discontinued.

April 26, 1911.—Destruction carried out as in Case No. 1.

Post-mortem appearances.—An organized blood-clot in the region of the fourth ventricle. On laying bare the spinal cord in the lumbar region a large amount of fluid could be seen in the sub-dural space. On removing a portion of the cord, a quantity of fluid escaped; also dripping from the cord after the removal. The cord was quite firm in section, as if sclerosed.

CASTRATION OF A DOUBLE RIG.

By J. J. O'CONNOR, M.R.C.V.S.

Professor in the Royal Veterinary College of Ireland, Dublin.

Subject.—A very big two-year-old of the hunter class.

Operation.—Cast, anæsthetized, fixed in the dorsal position with the long rope, flexing and spreading the hocks as much as possible and fixing up the fore limbs with stirrup leathers, Rarey fashion. Taking all aseptic and antiseptic precautions (cleaning out the sheath and covering the feet with antiseptic towels), I incised a transverse fold of skin over the near external inguinal ring, making an antero-posterior wound about 4 in. long. Beneath the skin there was a large plexus of distended veins, whose diameter was equal to that of a man's thumb and which felt somewhat like the epididymis. I carefully explored the inguinal canal and found there the epididymis enclosed in a fibrous sheath, opened the latter, but could not draw out the testicle through it. Consequently I passed my hand to the uppermost and outermost part of the canal, punctured its anterior wall with a perforator, inserted my first and second finger into the opening thus made and soon found the testicle, which was soft and flabby, about equal in size to that of a pullet's egg. I

removed it by means of the ecraseur, plugged the canal with sterilized gauze, and sutured the skin wound and dusted its vicinity with iodoform. I next proceeded in exactly the same way on the other side, in which the same condition of affairs was experienced.

In my opinion the procedure is easier in the complete than in the incomplete abdominal cryptorchid, as in the latter case the presence of the tunica vaginalis and epididymis in the canal hampers the operator by coming in his way during exploration. The opening in the tunica vaginalis is so small and non-dilatable that it is impossible to draw the testicle through it, even when the latter is small. I never hesitate about opening into the abdomen in such a case. I removed the plug in forty-eight hours. The horse was very little troubled by the operation, the resulting swelling was less than after an ordinary castration, which is my usual experience when a normal testicle has not been removed at the same time. No exercise was allowed for ten days, then only at a walk. I am never anxious to exercise after rig castration. Any swelling that forms is harmless; indeed, I think it is useful in preventing any tendency there might be to eventration of the bowels, which, however, has not occurred in my experience. With such small openings, situated high up, there would be little danger of its occurring in this or similar cases, but it is well to "make assurance doubly sure."

The horse was kept in a loose box and not allowed too much bulky diet; the wounds were splashed daily with antiseptic lotion. The animal was discharged in a fortnight after the operation.

THROMBOSIS OF THE ILIAC ARTERIES.

By J. J. O'CONNOR, M.R.C.V.S.,

Professor in the Royal Veterinary College of Ireland, Dublin.

Subject.—A seven-year-old bay carriage mare, of somewhat peevish temperament, lashing out when one attempted to handle her hind limbs.

History.—After trotting for about ten minutes the mare became lame in the near hind limb, showing a difficulty in taking it forward. As she progressed further the lameness be-

came more marked and eventually she stopped, refusing to go any further and showing symptoms of general distress. This was the only available history. I saw the mare trotted in the ring at a fast pace and fully ten minutes elapsed before the lameness became distinct, when she was not pressed further. This amount of exercise was not sufficient to cause sweating or much distress, but for about five minutes after it the mare seemed to suffer stinging pain in the affected limb, lifting it frequently. The veins on the lame limb were not so prominent as those on the other limb, and the former was colder than the latter. A rectal examination was not made. The case had already been diagnosed by another veterinary surgeon, who kindly allowed me the privilege of seeing it just before destroying the mare.

Post Mortem.—A large pale clot was found distending the posterior aorta at its division into the iliacs, all of which, except the right external iliac, were apparently completely occluded. There was a large aneurism with calcareous walls in the posterior mesenteric artery. It was said that this mare's mother suffered from the same affection.

RUPTURE OF THE COLON IN A HORSE.

By J. J. O'CONNOR, M.R.C.V.S.,

Professor in the Royal Veterinary College of Ireland, Dublin.

Subject.—A very old bay gelding, the property of a hawker.

History.—The previous day the horse got a big feed of grass cut from a garden, after which he showed symptoms of colic, for which the owner administered about a pint of oil, and as no improvement occurred, it was sent in for treatment.

Symptoms.—The animal was extremely weak, barely able to stand, and was in a condition of profound dejection, with imperceptible pulse. A stimulating draught was administered, after which the horse, which was on the grass in the quadrangle, kept backing, and vomited, with slight regurgitating noise, a small quantity of food material, which escaped through the nostrils. Within one hour afterwards he died.

Post Mortem.—The moment the abdominal cavity was opened

it was seen to contain large masses of ingesta formed of grass, with an admixture of considerable amount of sand (the animal came from Sandymount). A large complete rupture was found in the first part of the double colon, all of which was impacted with the ingesta described. On handling the bowel it was found to be very friable, rupturing on the slightest traction, although the *post-mortem* examination was made within four hours after death. The stomach was not ruptured.

SINUS IN THE AXILLA OF A POLO PONY.

By J J. O'CONNOR, M.R.C.V.S.,

Professor in the Royal Veterinary College of Ireland, Dublin.

Subject.—A very valuable six-year-old black polo pony.

History.—Eighteen months previously the pony had been staked in jumping a fence, the stake entering the caput muscles from the posterior aspect of the near axillary region. Apparently no portion of the stake could be found in the wound at the time and it was treated in the ordinary way, but without success. Different remedies were tried without avail. A persistent sinus developed, said to be 22 in. in depth at first. Eighteen months after the accident the case came under my charge.

Symptoms.—Lameness characterized by stiffness in the shoulder region of the near fore limb; a suppurating orifice barely admitting the tip of the little finger to the inside of the point of the elbow, a probe was passed into the opening for a distance of about 6 or 7 in., revealing a sinus extending upwards and forwards whose blind extremity felt hard.

Treatment.—The animal was cast and anæsthetized and the orifice enlarged upwards for a distance of about 3 in. On inserting the first finger into the passage I felt a hard foreign body in the depth of the sinus, and grasped it with a strong forceps. After a little effort I extracted the broken-off top of a cut hawthorn bush, measuring 4 in. in length and 1 in. in breadth. I then dressed the wound with tinct. iodi. for a few days and afterwards kept its lips clean with ordinary antiseptic lotion, whilst dry dressing was insufflated into the wound, which

was completely healed in four weeks after the operation, when the pony was discharged quite sound.

According to the history the sinus was 22 in. deep soon after the accident, whilst just before the operation it was 6 or 7 in. in depth, showing that the foreign body tended to become extruded.

ABNORMAL QUANTITY OF FAT IN THE TEMPORAL FOSSA OF A HORSE.

By J. J. O'CONNOR, M.R.C.V.S.,

Professor in the Royal Veterinary College of Ireland, Dublin.

Subject.—A big chestnut trotting horse, which had won trotting prizes.

History.—For some months past a swelling had been forming in the left temporal fossa and the horse had become troublesome and dangerous to drive in the city, shying badly on the side of the affected eye.

Symptoms.—A prominent doughy swelling in the near temporal fossa, extending above the level of the supra-orbital process. The corresponding eyeball was considerably protruded from the orbit and affected with a cataract. The horse was very nervous and resented the affected part being manipulated.

Treatment.—I cast and anæsthetized the horse and made an incision in the skin over the centre of the swelling and found that it was composed entirely of fat, some of which I removed. I then decided to extirpate the eyeball and did so at once, considering it the best way to get rid of the trouble from shying and restiveness in the streets. Plugged the orbit with antiseptic gauze and removed it next day. The second night after the operation the horse bled profusely from the nose, the bedding, walls and manger being heavily stained with blood. The bleeding had stopped spontaneously by the time the horse was seen in the morning and it never recurred. I do not know what was the cause of it. The wounds healed and the horse has been working now for months on the streets in a hackney car, cured of shying.

P.S.—Since writing up this case I have seen the horse, which

has just been brought to me on account of a snoring noise in the right nasal chamber, due to some obstruction there, the nature of which I have not yet ascertained.

NOTES ON SOME USEFUL SURGICAL INSTRUMENTS.

By E. WALLIS HOARE, F.R.C.V.S.,

Cork.

THOSE of us who have a *penchant* for investing in new instruments generally find that after a number of years they are in possession of a heterogeneous collection, amongst which are many inventions and patterns that are "laid on the shelf"; not sufficiently ancient to be preserved as relics, and still having cost so high a figure that we do not like to cast them into the "cave of oblivion." Instruments are discarded for many reasons: some are so clumsy in make that we soon replace them by more modern types. At one time the idea prevailed that veterinary instruments should be of enormous strength and bulk, probably a superstition handed down from the early days. Others are thrown aside because they have not fulfilled the functions attributed to them by their inventors and manufacturers; their virtues looked well when described in the instrument catalogue, but when tried they were found wanting. Others, again, were made with such inferior material that they gave way on being used for the first time. It will generally be admitted that in the present day there is a vast improvement in veterinary instruments, both as regards practical utility, portability and manufacture.

The advances which have been made in veterinary surgery have necessitated this improvement in instruments, and it must also be admitted that we have adopted many of the modern patterns used in human surgery.

As surgery is an art as well as a science, it follows that at every operation the practitioner learns something new, and centres his attention on the technique so that he may improve his knowledge in this direction. It is on these occasions that he learns the value or otherwise of new instruments, and devises improvements on those already in use.

I venture to draw attention to the following instruments, although it is possible that they are already known to many practitioners.

Artery Forceps.—Of the making of artery forceps "there is no end," and a very large number of patterns are on the market.

The following patterns I have found very useful:—

Mayo-Oschner's Forceps (Fig. 1).—In this, as will be seen from the illustration, the blades of the forceps terminate in sharp teeth; one is a single tooth, the other is bifid, and when closed the former fits tightly into the latter.

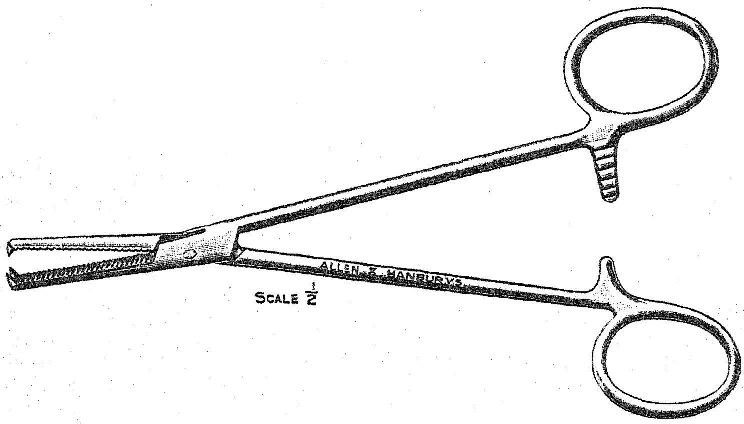


FIG. 1.

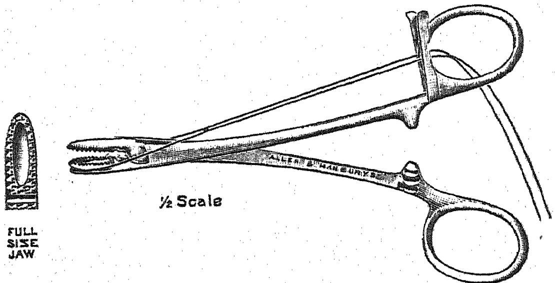


FIG. 2.

This forceps is very convenient for taking up deep-seated vessels of any size, and it can also be used as a pressure forceps, as the blades are serrated above the teeth. Even the smallest vessels can be secured with facility.

Shoemaker's Forceps and Ligature Holder (Fig. 2).—In this,

by means of a groove on the point of one of the blades and a spring on one of the handles, the ligature is placed in position before the forceps is applied to the vessel, hence in the case of a deep-seated vessel, once it is secured, it can be ligatured with certainty, as there is no risk that the knot will be tied on the point of the forceps. With ordinary forceps, under the above conditions, the difficulty of secure ligation is well known.

Finger Guard (Fig. 3).—This was invented by Dr. Child. In making dependent openings for the purpose of drainage in the case of extensive wounds, fistulous withers, poll-evil, &c., it is well known that the finger makes the most efficient director and probe, but there is always the risk of wounding this organ during the process. To avoid this danger, the finger guard is indispensable, and I have found it a most useful surgical accessory. It is made in various sizes to suit different individuals, and is jointed to correspond to the joints of the finger.

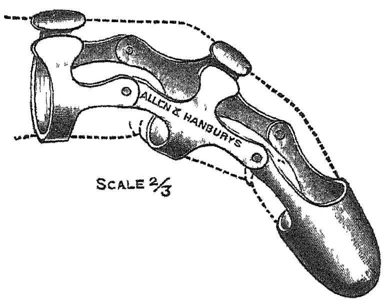


FIG. 3.

Mayo's Operating Scissors (Figs. 4 and 5).—These are the patterns used by Messrs. Mayo Bros., the celebrated surgeons, of Rochester, Minn., U.S.A. Every practitioner knows the value of scissors in surgical work, especially in the removal of deep-seated tumours and in operations for scirrhus cord. These instruments are beautifully finished and a pleasure to use, and they cut almost as clean as a knife. One pattern is straight, and can also be used as a blunt dissector when closed. Another pattern is angular in shape.

Lynn-Thomas's Self-threading Needles (Fig. 6).—The illustrations show the mechanism of these needles. Threading is carried out with the greatest facility, a matter of importance during

operations, especially to those of us whose sight is not as good as it used to be. In the case of small needles the advantages are still more apparent.

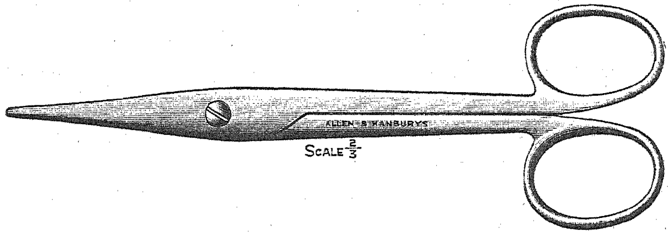


FIG. 4.

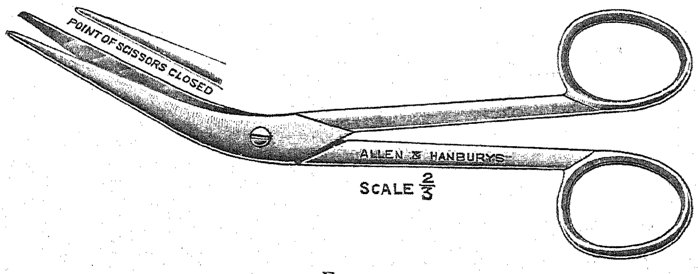


FIG. 5.

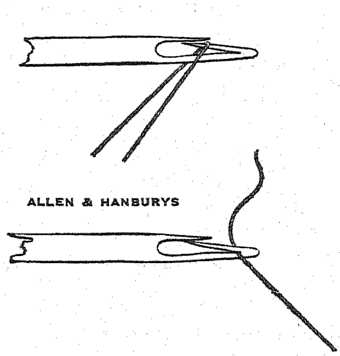


FIG. 6.

Dissector (Fig. 7).—Every practitioner who does much surgical work appreciates the value of a blunt dissector in the enucleation of tumours. It saves much labour, and in many situations is far safer than the knife. A very useful pattern is Arbuthnot Lane's, of which an illustration is given.

Obstetric Forceps for the Bitch (Fig. 8).—I suppose all canine surgeons possess a large supply of obstetric forceps. At any rate, I have almost every pattern, and should be glad to dispose of many of them cheap. The only real useful forceps I have invested in is that designed by Mr. Henry Gray, M.R.C.V.S., and for small bitches it has proved of marked value and assistance. It is very easily manipulated, very safe to use, takes up little room, affords a firm grasp, and has little tendency to catch the mucous membrane of the genital canal.

The illustration shows the shape, &c., of the instrument.

The above instruments are made by Messrs. Allen and Hanbury's, Wigmore Street, London.

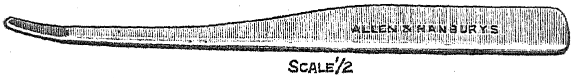


FIG. 7.

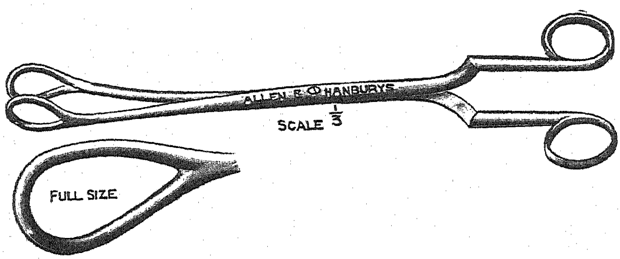


FIG. 8.

Blunk's Hæmostatic Forceps.—The suppression of hæmorrhage without applying a ligature to the bleeding vessel is of advantage in some instances. I have found the above forceps very useful in the castration of dogs and cats. By the application of gentle pressure, hæmorrhage from the spermatic artery is efficiently prevented, and the operation is rendered far simpler and quicker than by the application of a ligature; the results are also more satisfactory.

The inventor claims that vessels of any size can be efficiently sealed by this instrument, and the experiments carried out appear to support this statement. However, in one instance, I used

it in the case of a diseased spermatic cord in the dog and the result was not satisfactory, hence I have not employed it in the case of large vessels, and cannot state whether it is efficient or otherwise in this direction.

Malloch's Mouth Gag.—The existing mouth gags for the horse leave much to be desired as to convenience in use, portability, and price. Moreover, there are occasions on which they are absolutely dangerous to insert, especially in the case of young unhandled horses; they are troublesome to insert and often difficult to remove from the mouth.

The above instrument, which is invented and made by Mr. R. M. Malloch, M.R.C.V.S., of Kirkby Stephen, is one of the most useful instruments I have met with. It consists of two plates of iron formed in the shape of a wedge, and fitted with a handle. It is inserted between the molar teeth on one side,

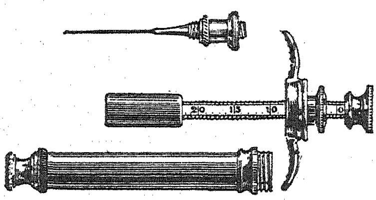


FIG. 9.

and retained there with no difficulty; by its use an excellent view can be obtained of the horse's mouth and teeth, and the latter can be easily examined. By changing the instrument to the other side of the mouth the molar teeth of the opposite side can be examined.

The horse seldom resists the application of the gag, and should he happen to fight, it can be removed immediately. It can also be used as a balling-iron, and is very portable, while last, but not least, the price is so moderate that it is within the reach of all. The importance of examining the mouth and teeth is well-known, and I think that all practitioners who try this little instrument will find that it will prove a most useful addition to their list of appliances.

Hypodermic Syringes.—A vast improvement in these is the pattern brought out by Messrs. Parke, Davis & Co., in which the

plunger is of metal and fits accurately to the glass barrel (fig. 9). This syringe works splendidly, and, when furnished with a proper needle, is a pleasure to work with. By a proper needle, I mean one that is of fine calibre and short in length; not one of those formerly employed in veterinary practice, which resembled more a cannula than a needle. It was imagined that because the horse and cow were large animals the hypodermic needle for use on them should also be large—a fetish which is now rapidly becoming exploded.

Another useful syringe is the all-metal one, similar to that used by dentists. This is of great value when it is desired to inject a local anæsthetic into dense structures, as considerable force can be employed.

Canine Clinical Notes.

A DIVIDED SPLEEN.

By O. CHARNOCK BRADLEY, M.D., D.Sc., M.R.C.V.S.,

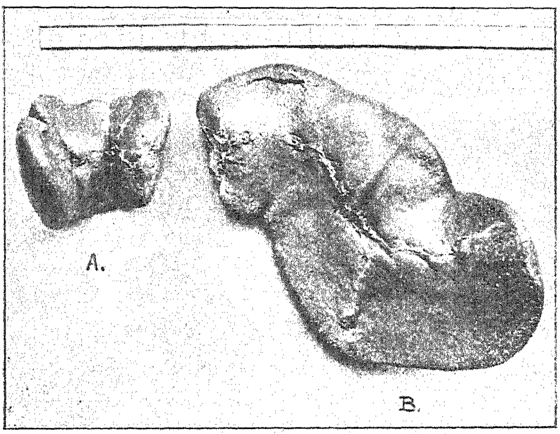
Principal of the Royal (Dick) Veterinary College, Edinburgh.

IN the course of the dissection of a young Irish terrier dog a condition of the spleen was encountered which can scarcely fail to be of interest to the anatomist, and may possibly be worthy the attention of the pathologist also. The spleen was nearly twice the size of the normal organ in an animal of the same breed, and weighed some 411 grm. Its surface was studded with numerous, rounded, pale elevations, and a naked-eye section showed that the whole interior of the organ contained like structures. Microscopic examination proved these to be splenic lymph-nodules (*Malpighian corpuscles*), larger and far more numerous than occur in the normal organ. The microscope, however, did not reveal any pathological change other than this hyperplasia of the lymphatic tissue.

To the anatomist the most interesting feature was the division of the organ into two parts. The smaller portion (A in the photograph) represented the somewhat sharply-curved dorsal

extremity of the normal spleen, and, though entirely independent of the larger ventral portion (B in the photograph), was in contact therewith. In other words, the organ was a perfectly-formed spleen with an interruption in the continuity of its tissue; a circumstance which prevents one regarding the smaller fragment as an accessory spleen. In cases of true accessory spleen there is a normally-shaped organ with one or more small, rounded collections of splenic tissue in its vicinity.

Failing more information, little can be said with certainty regarding the cause of the abnormality. It is easy to say that the specimen illustrates an aberration in development; but why the aberration occurred is not clear. As is well known, the



spleen develops as a mass of mesodermic cells in the mesogastrium; the shape of the growing mass undergoing change dependent upon the pressure exerted by surrounding viscera. In the present instance, however, mere pressure seems scarcely sufficient to account for the division, since the two parts together reproduce the shape of the entire normal organ.

Those who have examined a series of subjects in which the abdominal organs have been fixed and hardened *in situ* will remember that the dog's spleen normally presents a constriction of variable depth on or about the level at which the organ at present being considered is divided. One might say, therefore,

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that the division is merely an exaggeration of the customary constriction. Further observations are necessary, and the object of this note is to call the attention of those to whom opportunity offers.

CHRONIC BURSITIS IN IRISH WOLFHOUND.

By J. J. O'CONNOR, M.R.C.V.S.,

Professor in the Royal Veterinary College of Ireland, Dublin.

Subject.—A champion Irish wolfhound.

History.—A swelling had developed over the left tuber ischii, and had been opened but refused to heal.

Symptoms.—A callous ulcerous wound on the left buttock, forming the orifice of a fairly large cavity, lined by hard, lumpy granulations or vegetations of varying sizes; evidently a case of chronic bursitis.

Treatment.—Fixed the dog in the ventral position on the table. Injected 4 per cent. cocaine in four places around the swelling. Enlarged the opening and dissected away the lining of the cavity, thus removing all the callous tissue; dressed the cavity with tinct. iodine and inserted a pledget of gauze soaked in this solution. Dressed afterwards with tinct. iodine and antiseptic powder, but hard granulations formed in the wound and the cavity showed little tendency to close in. Silver nitrate stick was then applied to remove the callous granulations, after which chinosol lotion and dusting powder were used, but still the cavity was not diminishing in size. Strong ammonia and turpentine liniment was then applied to the wound and rubbed into the skin in its vicinity, and nothing more was applied to the wound for about ten days, when it seemed to be getting smaller and assuming a more healthy pink appearance, but yet the process of healing seemed very slow, and in order to stimulate it a biniodide blister (1-8) was applied to and around the lesion, which was then left alone, and it gradually healed completely, but the cicatrical tissue was very indurated, a hard nodular scar being left at the site of operation. The habit which the dog had of lying on his buttocks was a great obstacle

to healing and accounted for the induration. The bursa on the other side was also enlarged, but did not require treatment. The case was one in which the cause continued to operate. It was impossible to prevent the animal's lying down in the fashion mentioned. The hyperæmic treatment with liniment and blister was the only effective one.

FISTULA THROUGH THE RADIUS OF A RED SETTER.

By J. J. O'CONNOR, M.R.C.V.S.,

Professor in the Royal Veterinary College of Ireland, Dublin.

Subject.—A red setter dog.

History.—The animal had been attacked by another dog which inflicted a wound on the middle third of the right forearm, which the owner thought would heal in the ordinary way, but it refused to do so, and after the lapse of three months the dog was brought for treatment.

Symptoms.—A bony enlargement involving the anterior and lateral aspects of the right forearm, hot and painful to the feel, and showing two weeping orifices, one on the inside and the other on the outside of the swelling. Although the animal put weight on the limb, he was very lame.

Treatment.—Anæsthetized with chloroform, applied a tourniquet in the upper region of the forearm, incised and reflected the skin at each orifice, and curetted the sinuses with a sharp curette, making a cavity in the bone and causing the two orifices to communicate through it; dressed the wound with tinct. iodine and a mixture of iodoform and boric acid, plugged the cavity with sterilized gauze squeezed out of tinct. iodine, and covered the affected part with sterilized pad and bandage; renewed the dressing daily. After a fortnight a small piece of loose bone came away. The discharge from the wound then gradually diminished until it stopped altogether, the animal making a good recovery, the lameness disappearing.

Reports.

VETERINARY POST-GRADUATE STUDY.*

By STEWART STOCKMAN, M.R.C.V.S.,

Chief Veterinary Officer to the Board of Agriculture.

A CUSTOMARY remark from benevolent old gentlemen to small boys is, or at least used to be, "What are you going to be when you are a man?" As I do not wish you to look upon me as a benevolent old gentleman, but rather as one who has gone a certain way along the professional road you are about to traverse, I promise not to treat you as children. Still, gentlemen, if you have not already done so, you must sooner or later ask yourselves what you are going to do when you are qualified, and this brings me to one part of the subject upon which I propose to address you, namely, post-graduate teaching and post-graduate study. It may seem somewhat curious to address advice to men on post-graduate study before they have finished, and before some of them have even begun, their undergraduate course. The direction of the latter, however, is provided for by the system of professional education obtaining in this country, which requires students to attend a course of theoretical and practical instruction under teachers at recognized teaching institutions, and afterwards to pass through the ordeal of examination as a test of efficiency, thus compelling them to acquire a certain amount of knowledge before they can pass from one stage to another, and finally qualify. The course of study prescribed for intending graduates in veterinary medicine and surgery is, having regard to its purpose, as wide as that of other professions, but it must be remembered that the amount of knowledge which seems fair to insist upon the average student acquiring in a specified time is necessarily limited; therefore a syllabus of examination is introduced. A teacher may or may not teach within the limits of this syllabus. He may even think it his duty to do so, but most students are likely to confine their more strenuous efforts within its boundaries, and they can hardly be blamed for this, since it increases their prospects of passing the examinations at the earliest date possible. The restricting influence of this system may be counteracted by prescribing a wider syllabus. That, however, means a longer period of undergraduate study, and as the majority of students, even the most enthusiastic, take up a profession with the object of making a livelihood by supplying a public want, it does not seem advisable that they should be too long debarred from practising their profession, should they desire to do so, nor that the expenses connected with their tuition should be disproportionate to the average income available from it. Further, al-

* Opening Address delivered at the Royal Veterinary College, London, October, 1911.

though it must be freely admitted that study and teaching up to a certain point expedite the acquisition of skill, which is an indispensable factor in the successful practice of the medical art in all its branches, and that they open up wider fields for its application after it has been acquired, no amount of learning and tuition without practice will make a man skilful in any branch of the medical profession. The minimum time a student should be asked to devote to the study of the multiple rudiments of a profession like medicine has given rise to frequent controversy, which for the present has resulted in the presiding bodies imposing a general curriculum of a comprehensive character, leaving the further pursuit of subjects now universally admitted to require special teaching to those who are able, and disposed, to follow them. The universities and colleges have organized post-graduate teaching in connection with some of these subjects, and several medical colleges, exclusively devoted to post-graduate teaching, have recently come into existence.

Certain veterinary colleges in this country have made more or less provision for post-graduate teaching and it is gratifying to know that the post-graduate course of the Royal Veterinary College, London, has acquired a unique reputation throughout the British Empire. Special degrees and diplomas are granted by the universities and colleges to those who have attended a course of post-graduate teaching, and passed further examinations. The Body presiding over veterinary education in this country, The Royal College of Veterinary Surgeons, has not yet seen its way to grant a post-graduate diploma, conditional to candidates following a special curriculum, and passing further examinations, but it has approved the principle, and has signified willingness to put the latter into practice, when its funds enable it to do so in a manner befitting its public responsibilities. It is to be observed, however, that the scope of these courses of study for post-graduate degrees and diplomas is necessarily limited, that a syllabus of examination is introduced, and that a pass standard is fixed; the students are still in the position of being taught *in statu pupillari*. Yet, with all its defects the system has much to recommend it, and it supplies organized teaching of a more advanced kind to formed classes of men who desire to become more proficient in certain subjects. Supplementary diplomas afford evidence of a desire on the part of the holders to obtain more than a bare qualification, the additional learning forms a broader basis for a future superstructure, and they have also a commercial value, something the possession of which professional etiquette allows you to advertise by placing letters after your name, something which at least receives consideration should you apply for a public appointment. I would advise you badly, were I to dissuade you from post-graduate degrees and diplomas, but I would like to qualify this advice with a warning not to submit yourselves for too long a period of your lives, or at too mature an age, to those forms of instruction which bear a resemblance to spoon-feeding. The most

desirable kind of post-graduate degree would seem to be one which might be granted to aspirants after a suitable examination, or for original work submitted, in recognition of extensive knowledge and skill in specified subjects, which their powers of self-education have enabled them to acquire by practice and study several years after their days of tuition. But, gentlemen, a man may take many degrees or diplomas by tuition and examination, he may even become very learned, and yet be a comparatively useless person in a profession which is an art founded upon science, and it was not so much to post-graduate study by following a conventional curriculum and taking a diploma I intended to draw your attention, as to that kind of education a man may seek out for himself, and to a certain extent direct.

The position of the veterinary practitioner is the most difficult in this respect. Veterinary clinics and hospitals, where a large and varied number of medical and surgical cases can be seen daily, are only to be found at veterinary schools in very populous cities like London, Paris, Berlin, and Vienna—schools, moreover, which lay themselves out for clinical teaching. Further, the possession of a practice from which he dare not be long absent is an obstacle the practitioner cannot afford to disregard. Still, few men start general practice on their own account for some years after they have received the qualifying diploma, and those who are able to continue their studies will gain more knowledge of clinical medicine and surgery in six months by a well-designed course of post-graduate study at one or more of the large veterinary schools, than they will acquire by years spent in general practice. The fees involved are almost negligible, the cost of living as a student in a foreign city is not great, and the expenses of travelling need not be prohibitive. A graduate might attend the clinic and *post-mortem* room, he might arrange to have the *entrée* to the chemical, physiological, and pathological laboratories, where he can receive direction in relation to the carrying out of chemical and physiological tests applicable to the body fluids and excretions, and be in a position to practise with material from the clinic the bacteriological and other methods which can be made use of in practice, principally in connection with diagnosis and treatment. He will probably have to make the selection of his own cases, and collect his material, but that is more an advantage than a drawback.

Those who desire to become more proficient in matters relating to State veterinary medicine would be well advised to take out a course of instruction in the ordinary technique practised in pathological and bacteriological laboratories, and to follow this up by spending several months in one or more of these laboratories, assisting the staff, and learning from them by conversation and observation.

In dealing with the suppression of epizootics prompt and accurate diagnosis is the starting point of everything which leads to success, and an error may lead to the most disastrous results, in some cases even to a national calamity. Further, a

veterinary inspector, whether he serves under the central or local authorities, occupies a somewhat unique and very responsible position in relation to diagnosis. Under the Diseases of Animals Act of 1894, the certificate of a veterinary inspector is conclusive evidence in a court of law that disease exists, and practically every Order of the Board of Agriculture lays down that an official diagnosis in respect of all scheduled diseases is to be made by a veterinary surgeon occupying the position of veterinary inspector.

The veterinary surgeon, then, who intends to take up preventive medicine should not only extend his clinical experience of the contagious diseases of animals, but he should devote a good deal of his time in the laboratory to making himself acquainted with the technique and proper application of histological examination, and of those bacteriological methods which are of very considerable value in the diagnosis of bacterial diseases in their occult stages. The behaviour of the test animals of the laboratory towards the viruses of these diseases should also receive much attention. It is not suggested that technique alone will make a man an authority on veterinary sanitary science. It is obvious, of course, that he must also devote much study to the multiplicity of factors which operate in the dissemination of disease, and to methods of control and eradication; that is, to those subjects which have been grouped under the heading of epizootiology. The best fields for educational efforts of this kind are again the laboratories of the veterinary schools with large clinic and the laboratories of State departments. It is advisable that a portion of the period of study should be spent on the Continent, because a varied experience is of itself educative: and it is necessary, if you wish to make the acquaintance of certain diseases which have been either banished from this country, or not yet allowed to enter it, but for which veterinary inspectors must always be looking out. I refer to such diseases as cattle plague, pleuro-pneumonia, rabies, epizootic lymphangitis, sheep-pox, dourine, and I think even a hypercritical public might agree to foot-and-mouth disease being included in this not unimportant list. It may be asked what length of time a man should devote to this kind of training. I think the reply is, until he feels capable of catching new ideas and methods as they rise, and competent to submit them to examination, that he may not be automatically carried away by every wind that blows, however seductive. It is certain that in this country, at least, the State veterinarian will never have the good fortune of finding a clean slate upon which to commence operations. It is therefore advisable that he should also devote a considerable amount of attention to the relative importance of good science and good administrative government, and to the necessary compromises which must often be made to make his operations accord with both.

Those whose bent decides them to train seriously as scientific investigators will have elected to pursue a course of study which

is the most emancipated and attractive, but at the same time the most arduous and endless. Whatever be the subject which has stimulated you to devote yourself to it, training is to be acquired by serving periods of apprenticeship, as it were, under one or several distinguished masters. It is advisable, also, that some attention should be given to teaching as a profession, since it is included in the duties of some of the appointments you may wish to obtain.

No doubt you will ask yourselves what the material prospects are for men who have studied hard to acquire special proficiency in the various branches of the veterinary profession. I would suggest to you, in the first place, that a feeling of greater competence, if it does not arise merely from conceit, is worth something, and although competence may not always bring material rewards, it very frequently does.

General practice is the widest outlet, and will always absorb the greatest number of followers. Moreover, it is an open-air life, and it is the most lucrative branch of the veterinary profession. Nobody can shut his eyes, of course, to the fact that, in the cities at least, a great deal of horse traction has been replaced by motor-driven vehicles. In country practice, however, the horse is by no means the only animal for which the services of veterinary surgeons are required, nor does it seem to be approaching extinction. There has certainly been a falling off in the horse-breeding industry, as regards light horses at least, but, as you are no doubt aware, an organized movement supported by public funds is now on foot to encourage farmers to breed the still very indispensable commodity, the weight-carrying horse.

I am inclined to think that general practice is not nearly so depressed as some practitioners would have us believe, and I would point out that, although the Chancellor of the Exchequer has not seen his way to make concessions in relation to the tax on petrol used by practitioners for their magnificent motor-cars, he has so far refrained from threatening the profession with an Insurance Act forcing them to treat their patients for six shillings per annum, medicine included.

Those who take up veterinary State medicine must look to the departmental and municipal services for employment. I doubt if it is fully realized that there are at least twelve British Colonies and Protectorates which recruit their veterinary departments exclusively from the colleges of the United Kingdom, while there are several others in which British graduates stand a good chance of employment. Some of the former departments are certainly small, and are never likely to require more than one or two officers, but the majority are considerable, or small only because they have been very recently established. Seven have come into existence in the last six years, five of which promise considerable development. I am in a position to say that at least two important principles influenced the authorities in establishing these departments, namely, that the first thing to do before settling a colony is to settle the question of its

animal diseases, as far as possible, and that it would be unwise to send out any but the best qualified men available for this purpose. It is not in the Colonies and Protectorates alone, however, that the expert in State veterinary medicine is in request. At home we have the Veterinary Department of the Board of Agriculture, the chief duties of which are to control and investigate diseases of animals. I hope I may be excused if, for the purpose of accentuating the importance and permanence of organized departments of preventive veterinary medicine, I mention the fact that in the four last years foot-and-mouth disease has in mysterious ways been imported into Great Britain no less than six times, and that each outbreak was completely suppressed in little more than a week at a total cost of a few thousand pounds. This disease was imported five times during the nine months of the present year, and spread to four premises from the original outbreak. The importance of preventive medicine in Great Britain will be realized by consulting the latest returns from the Continent, which show that during August alone 37,737 outbreaks of foot-and-mouth disease were recorded in Germany; in July 12,385 were recorded in Holland; 4,097 in Belgium; and 16,027 in France, where it has been estimated that the loss will amount to over fifteen millions sterling.

In addition to those diseases which are already scheduled, and for dealing with which the services of specially trained veterinary surgeons are required, there are others of the first importance, notably Jöhne's disease, epizootic abortion, and tuberculosis. These only await the final ripening process of public opinion to add them to the list. They are not diseases the prevalence of which is the least likely to be influenced by ordering an extra few hundred cubic feet of air space. Progress will only be effected by reporting, followed by skilful diagnosis, and tracing up the sources of infection with the view of suppressing them, and such work can only be done well by specially trained veterinarians.

I am not going to commit the indiscretion of prediction, but I would observe that the view that the Diseases of Animals Committees of the County Councils should have at their exclusive command the advice and other services of veterinarians specially trained in State Veterinary Medicine, has so much to commend it that it is possibly not very far off consummation.

I have left the largest Department, the Army Veterinary Service, to the last, because in this case special knowledge of preventive medicine is not the sole professional recommendation. I understand, however, that special qualifications of this kind are regarded with no small favour.

In the world of veterinary investigation and research there is ample room for numerous devotees. Veterinary pathology has attracted a few men, but too few to devote their professional lives to its study. Physiological investigation has been almost severely left alone by British veterinarians. The services of veterinary helminthologists are urgently required in the interests

of agriculture, and veterinarians with special training and skill in this branch of their profession would be practically sure of employment. Of course it has to be admitted that the prolongation of the period of unremunerative work consequent upon training increases considerably the cost of education. It is difficult to believe, however, that poverty alone, on the part of parents at least, has been the cause of so few graduates training in veterinary science as distinct from practice; but I would like to draw your attention to the material assistance which the Board of Agriculture, from money allocated from the Development Fund, offer to promising graduates who desire to train seriously as investigators. Twelve scholarships of the value of £150 a year for three years will be offered in each of the years 1911, 1912, and 1913. Veterinary graduates of distinction will be eligible for such scholarships, which, it should be noted, will not be awarded to enable the recipient to work for degrees by examination, but to train as investigators. This, however, is not all; under the same scheme for the development of agricultural research and investigation funds will be available to enable certain institutions to maintain workers on specified subjects, some of which are veterinary, and, undoubtedly, there will be a more assured future than heretofore for those whose qualifications deserve recognition. There has never been a time in the history of veterinary medicine in this country when the prospects seemed so encouraging for those who elect to devote themselves seriously to preventive medicine or to research. I think I might also say that there is no branch of the profession you have chosen which is in the least overcrowded. Small as our numbers are, however, I feel sure that as a profession we will do our best to play up to what new opportunities have been given us, and to make our response a good argument upon which to base demands for more.

To come back now to the all-important question of what you are going to do when you are qualified. May I advise you, while giving the fullest consideration to what men of knowledge and experience have to say, that the process of making up your minds should in no sense be a passive one.

THE AMERICAN VETERINARY MEDICAL ASSOCIATION.

The forty-eighth annual meeting of the American Veterinary Medical Association was held at Toronto on August 22, 23, 24, and 25, the place of meeting being the Convocation Hall of the University. There were present about 800 members and visitors, and the proceedings were carried through without a hitch. More than 230 new members were elected, all graduates of colleges whose educational standard is approved by the Council of the Association. Various lecture theatres of the University were placed at the disposal of the several sections, and the practical demonstrations were held in

the Clinical Department of the Ontario Veterinary College, where a large marquee had been erected to facilitate comfort in the event of extremes of weather. The chair was taken by the President (Mr. George H. Glover, of Fort Collins, Colorado), and the Convention was formally opened by the Hon. Mr. Duff, who, as the representative of the Premier of the Province of Ontario, welcomed the delegates to Canada. He spoke highly of the good work which veterinary science had done, and was doing, for Canada, a country whose prosperity depended so much upon the health of its live stock, and foretold a bright future for the Ontario Veterinary College. The latter is now affiliated with the University, and a new site has recently been purchased; new buildings are about to be erected at an estimated cost of £40,000, and of this the Government has already passed a grant for half this amount, so that the work may be commenced without delay. The new Principal, Professor Grange, is already busy with the plans, and, when complete, the College promises to be one of the finest and best equipped on the American continent.

The Ontario College can claim more graduates than any other school on that side of the Atlantic, and was founded some forty years ago by the late Professor Andrew Smith, F.R.C.V.S., a graduate of the Dick College in Edinburgh. Until recently it has only had a two-years' course, but now the course is three years, and the old qualification of V.S. has been altered to B.V.Sc., with a further degree of "Doctor" after another year's study and post-graduate course.

Mr. Duff's address of welcome was followed by the presidential address of Mr. George Glover. This gentleman has made the higher education of the veterinary student his life's hobby, and his speeches throughout the meeting and social function demonstrated how earnestly he had thought out the subject.

President Glover's address was followed by a hearty address of welcome to the City of Toronto by Mr. George Geary, the Mayor, after which the more serious business of the technical papers and discussions commenced.

It is the custom each year for the Association to appoint small committees to enter into, and discuss, various problems of interest to the profession, and each committee deputes one or more of its members to read a paper or report upon the particular point in question. This is brought before the next annual meeting. For example, committees were appointed to report, amongst other things, upon "Intelligence and Education," "Diseases," "Legislation," "Publication," "Tuberculosis Commission," "Resolutions to be sent to various authorities," &c., and by way of illustrating what was done, the report, for example, of the committee on intelligence and education evolved three papers—one by Dr. C. H. Starge on "Some Educational Problems," a second by Dr. L. A. Merrillat on "Can the practitioner hope to be a successful teacher?" and a

third by Dr. Veranus A. Moore on "American Veterinary Education and its Problems."

The report of the committee on diseases brought forward five papers, as follows:—

(*a*) "The Recurrence of Dourine in the United States," by Dr. John Mohler.

(*b*) "Foot Evil in Horses and Mules; Sore Mouth in Dogs," by Dr. W. H. Dalrymple.

(*c*) "Serum Vaccine and Serum Vaccine Therapy," by Dr. A. T. Kinsley.

(*d*) "The Laboratory and the Practitioner," by Dr. Charles Higgins.

(*e*) "The Effect of Nuclein on the Blood," by Dr. B. F. Kauff.

These reports were read, but not commented upon, as discussion was not allowed on account of time.

The literary programme was divided into sections and held in different rooms at the same time, as the papers were very numerous and the discussion in some instances well sustained.

The divisions were as follows:—

Division No. 1. Pharmacy and Materia Medica, in charge of Dr. Jensen.

Papers as follows were read and discussed:—

(1) "Newer Therapeutic Agents," by Dr. P. A. Fish, of Cornell University, New York.

(2) "Biologic Therapeutics," by Dr. Dunphy, of Detroit.

(3) "Pharmaceutical Items of Interest to Veterinarians," by Dr. Ferd Mueller, of Indianapolis.

(4) "Practical Therapeutics," by Dr. Quitman, Chicago.

(5) "Selective Vasoconstrictors and Vasodilators," by Dr. Jensen, Kansas City.

Division No. 2. Surgery, in charge of Dr. A. L. Merrillat.

(1) "Observations on the Merits and Practicability of Resection of the Perforans Tendon for Open Navicula Bursæ; and Bayer's Operation for Quittor," by George Bern, D.V.S., New York. Discussion opened by Joseph Hughes, M.R.C.V.S., Chicago.

(2) "The Merits of Williams's Operation for Roaring," by Frederick Hobday, F.R.C.V.S., London, Eng. Discussion opened by W. L. Williams, D.V.S., Ithaca, New York.

(3) "Poll Evil," by R. C. Moore, D.V.S., Kansas City. Discussion opened by L. A. Merrillat, V.S., Chicago.

(4) "Observations on the Bacterin Treatment of Suppurative Processes," by Chas. H. Jewell, D.V.M., Fort Riley, Kansas. Discussion opened by A. T. Kinsley, D.V.S., Kansas City.

(5) "My Experience of Ovariotomy in Mares," by H. Fulstow, V.S., Norwalk, Ohio. Discussion opened by J. H. McNeil, V.M.D., Columbus, Ohio.

(6) "Stringhalt, with Special Reference to its Surgical Treatment," by C. C. Lyford, D.V.S., Minneapolis. Discussion opened by J. H. Blattenberg, V.S., Lima, Ohio.

Division No. 3. *Practice, in charge of Dr. George H. Roberts.*

(1) "The Cause and Treatment of Pulmonary Emphysema," by Dr. W. G. Hollingworth, Utica, New York.

(2) "Hog Cholera Serum," by Dr. F. A. Bolser, New Castle, Indianapolis.

(3) "Gastro-Intestinal Catarrh," by Dr. D. H. Udall, Ithaca, New York.

(4) "Traumatic Pericarditis," by Dr. George H. Roberts.

(5) "Strangles," by Dr. John Devine, Goshen, New York.

(6) "The Treatment of Pneumonia and Pleurisy," by Dr. H. Preston Hoskins, Philadelphia, Pennsylvania.

(7) "Azoturia," by Dr. S. Brenton, Detroit, Michigan.

Division No. 4. *Pathology and Bacteriology, in charge of Dr. John R. Mohler.*

(1) "Observations on the Pathology of Roup and Epithelioma Contagiosum," by Drs. C. M. Haring and C. A. Kofoid.

(2) "The Pathology of Nephritic Affections in Domesticated Animals," by Karl F. Meyer, Philadelphia, Pennsylvania.

(3) "An Undescribed Pathogenic Bacterium in Milk," by Dr. E. C. Schroeder and W. E. Cotton, Bureau Experiment Station, Department of Agriculture.

(4) "Immune Bodies and Biological Reactions," by Dr. Adolph Eichorn, Pathological Division, B.A.I., Department of Agriculture.

(5) "Preventive Treatment of Rabies in Animals," by John Reichel, Glenolden, Pennsylvania.

(6) "The Etiology of Infectious Abortion in Live Stock," by Professor E. S. Good, Kentucky Agricultural Experiment Station, Lexington, Kentucky.

(7) "The Results obtained in the Eradication of Tuberculosis from a Herd by the use of Tuberculosis Vaccine and the Bang System," by S. H. Gilliland, V.M.D., M.D., Marietta, Pennsylvania.

Division No. 5. *Veterinary Sanitary Police Measures, in charge of Dr. J. G. Rutherford.*

Papers by the following:—

(1) "Some of the Features of Sanitary Police Work as applied in the Federal Quarantine Service," by Dr. R. G. Hickman, Washington, D.C.

(2) "The Tuberculin Testing of Cattle," by Dr. Paul Fischer, Columbus, Ohio.

(3) "Anthrax and Tick Fever," by Dr. W. H. Dalrymple, Baton Rouge, Louisiana.

Division No. 6. *Meat and Milk Hygiene, in charge of Dr. Louis A. Klein.*

(1) "Municipal Meat Inspection of Paris, Texas," by Dr. F. G. Cook, City Meat and Milk Inspector, Paris, Texas.

(2) "State Dairy Inspection," by Dr. M. E. Knowles, State Veterinarian of Montana, Helena, Montana.

(3) "Dairy Farm Inspection in Pennsylvania," by Wm. S. Gimper, Philadelphia, Pennsylvania.

The Clinical Demonstrations.

The practical part of the programme was reserved until the 25th, and lasted all day, being well attended by a large crowd of members. A tent had been erected on a spare plot of ground adjoining the operating-rooms of the Ontario Veterinary College, and, in addition to this, the College operating tables were put into use indoors. Between fifteen and twenty patients were operated upon by experts who had made the particular operation in question a speciality. In the horse a method of washing out the stomach was demonstrated by Drs. Blattenberg and Merrillat, and these gentlemen also illustrated certain methods of suturing wounds, &c.; a case of poll evil was operated upon by Drs. Moore and Kelly; Dr. Klotz operated upon a cryptorchid; Dr. White, of Chicago, performed ovaro-hysterectomy of the bitch; Dr. White, of Nashville, Tennessee, showed numerous and ingenious methods of tying and securing animals for facilitating various operations; and Mr. Hobday operated on three roarers, a bulldog with prolapse of the mucous membrane of the penis, a bull bitch with ulcerative granuloma of the vagina, and a cat with a cyst of the ear.

Social Events.

There was really very little time for festivities, as several of the discussions were resumed in the evening, but a moonlight excursion by steamer on Lake Ontario was participated in on Wednesday evening, at the invitation of the city authorities, and on the Thursday a special invitation was extended to the ladies of the party for a drive around the city and a garden party at Sir Henry Pellatt's, whose magnificently equipped stables and horses were inspected.

On Thursday evening (the 24th) the annual banquet was held, under the guidance of Dr. J. G. Rutherford, whose general popularity and ready wit made him a most admirable chairman and toastmaster. The guests included several of the notable men of the City of Toronto, and the toasts, after those of "The King" and "The President of the United States" had been honoured, included "The Veterinary Sanitary Service," responded to by Dr. A. D. Melvin; "Veterinary Education in the States and Canada," responded to by Drs. Glover and Grange respectively; "The Royal College of Veterinary Surgeons," responded to by Professor Hobday; "The Live Stock Industry of Canada," responded to by Dr. Creelman; "The Practitioner," by Dr. Torrance; "Contributors to Veterinary Science," by Dr. Horace Hoskins; and "The Press," by Dr. Ellis.

Altogether the meeting was a great success, and a great deal of good was done towards furthering the forward progress of the profession. Afterwards the members split up into small parties—some to visit the Thousand Isles, a most beautiful

river trip up the St. Lawrence, with magnificent scenery; some to visit Niagara Falls, and others to take a further trip to one or other of the interesting places of which there is such a plentiful selection both in Canada and the United States.

Translations.

THE SUBCUTANEOUS INJECTION OF OIL OF TURPENTINE AND ITS EMPLOYMENT AS A REVULSIVE.

By Professor FRICK

(From the Surgical Clinique of the Veterinary High School at Hanover).

Professor Frick has found injections of oil of turpentine very practical and effective when injected at the shoulder, elbow-joint, hip and knee-joint, and has employed it as a revulsive for five to six years.

He uses the officinal oil of turpentine without any special preparation, and injects it with a Pravat's syringe at the shoulder, hip or knee-joint. It is best to use a thin needle, because, if some turpentine runs out on to the skin from the puncture wound, it irritates the skin and causes the horse to become restless. The skin at the puncture places is first disinfected with tincture of iodine. A large quantity of the drug is not injected at one place, but 1 grm. at each of four or five places round the joint. After twenty-four hours circumscribed painful swellings occur, which, in the course of the next day, become confluent with each other. In a further ten to fifteen days the diffuse swelling declines, and round, fluctuating places as large as one's fist are present, which many times communicate with each other. These so-called aseptic abscesses, if no mechanical insults occur to them, become completely reabsorbed in a further fourteen days. These swellings must not be opened, but if by accident this occurs, a shiny clotted material escapes which smells of turpentine, but it is perfectly aseptic, and consists of a combination of round cells and connective tissue shreds. An opened cavity may be emptied by pressure, and, if left to itself, heals quickly in three to four days. The deep effect of these injections on the joints is a very severe one, and lamenesses which have resisted all other methods have disappeared after this one, and I can recommend it as very practical.

(*Deutsche Tierärzt. Wochenschrift.*)

FILARIASIS OF THE FLEXOR TENDONS.

By PAUL DUDZUS.

One of the most remarkable happenings is the occurrence of worms inside tendons which by their presence cause specific inflammation. In horses, asses and mules a round worm, *Filaria reticulata*, occurs in the flexor tendons and ligaments of the

neck, especially in Italy, Russia and France. In Germany this parasite is seldom noticed, but it occurs in the tendons, in the connective tissue and the winding blood-vessels of the extremities, and in these positions often in the form of nests or balls without causing injury. In individual cases, however, it may lead to considerable anatomical disturbance in the tissues affected, the formation of nodular inflammatory spots in the flexor tendons, fibrous swelling in the connective tissue of the metacarpus and in the vessel walls, and to incurable lameness. Since the discovery of these parasites in the year 1838, by the English veterinary surgeon Ferguson, numerous reports have been published concerning them. Only broken pieces of the worm have hitherto been obtained. It has never been recovered in its entirety and full length. The author made examinations on two sets of flexor tendons from a 13-year-old horse, which came from Russia and was slaughtered, and in which he found the parasites. Both flexor tendons were double their normal thickness, hard, warm and sensitive to pressure. The animal showed a stretched gait on both fore-limbs without being actually lame. When cut lengthways a number of long elliptical spots were found in the tissue of the tendons and in the tissue bundles, and these cavities contained worms rolled spirally. The geographical distribution of the disease is noteworthy, also that it is only occasional to find a case in Germany. Treatment can only be symptomatic. The method of wandering of the parasite is unknown, and on prophylactic treatment nothing definite can be said.

(*Monatshefte für die praktische Tierheilkunde.*)

Letters and Communications, &c.

Professor Craig; Dr. Stapley; Mr. S. Stockman; Professor O'Connor; Mr. E. Wallis Hoare; Mr. A. W. Noël Pillers; Mr. C. W. Townsend; Capt. A. J. Williams; Dr. Rutherford; Board of Agriculture and Fisheries; Department of Agriculture and Technical Instruction for Ireland.

Books and Periodicals, &c., Received.

Veterinary Bacteriology, by Robt. E. Buchanan, Ph.D. (pp. 516, with 214 illustrations, 13s. net.), published by W. B. Saunders' Company, London; Lameness in Horses: Its Detection, Cause and Treatment, by A. C. Piesse, M.R.C.V.S. (pp. 82, profusely illustrated, 3s. net), published by The Cable Printing and Publishing Co., London; Bulletin of the Bureau of Sleeping Sickness; Agricultural Journal for the Union of South Africa; Rhodesian Agricultural Journal; Report of the Director of the Department of Agriculture for Canada.

NOTE.—All communications should be addressed to 8, Henrietta Street, Covent Garden, London, W.C. Telephone, 4646 Gerrard. Telegrams, "Baillière. London."

Letters for the JOURNAL, literary contributions, reports, notices, books for review, exchanges, new instruments or materials, and all matter for publication (except advertisements) should be addressed to the Editors.

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Illustrations for reproduction should be in good black or dark brown on white paper or card.

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Austin Peters

THE

VETERINARY JOURNAL

DECEMBER, 1911.

Editorial.

FOOT-AND-MOUTH DISEASE.

The recent statement of the President of the Board of Agriculture that he intends appointing a scientific committee to investigate foot-and-mouth disease has caused great satisfaction amongst veterinary surgeons and agriculturists in general. The new President has apparently decided to appoint two home veterinary experts to proceed to India where the disease is unfortunately very rife, and there to co-operate with two experts nominated by the Indian Government. Their terms of reference will be "to investigate the special characters of the disease, its etiology, the means by which it is contracted and spread, and practicable means of prevention." The personnel of the committee is not yet decided.

Since the announcement of the above intention a very interesting, and, if it should be confirmed, a most important, claim to the discovery of the causal organism of foot-and-mouth disease has been made by a German pathologist, Dr. Siegel. At the recent annual congress of Prussian veterinary surgeons at Berlin Dr. Siegel announced that he had discovered the organism of foot-and-mouth disease in the blood and lesions of affected animals; that he had been able to cultivate it in artificial media; and that in experimenting with it he had been able to satisfy all

the postulates of Koch. He, moreover, claims to be able to produce some degree of immunity. No details are to hand yet, however, and we are therefore unable to offer any criticism as to the probable accuracy of the avowed discovery. In the meantime the announcement must be accepted with reserve, as must obviously be accorded the statement of the discovery of an organism which has hitherto eluded the vigorous and systematic search by other experts of almost all nationalities.

The appointment of a British expert committee is therefore very opportune, and one of their first duties, no doubt, will be to investigate the claims of Dr. Siegel; if he has made out a *prima facie* case, they will repeat his experiments, and either confirm or refute them. We trust they will be confirmed, as the discovery will be one of the greatest possible moment to the whole of the agricultural world.

The President of the Board of Agriculture has also appointed an important Parliamentary Committee "to inquire into the circumstances of the recent outbreaks of foot-and-mouth disease in England, and to consider whether any further measures can be adopted to prevent their recurrence." It is to be hoped that such results will be attained as will enable us to continue to enjoy the markets of the world for our live stock in consequence of the freedom of the British Isles from such animal scourges.

A Correction.

Mr. W. H. Dalrymple, M.R.C.V.S., of the Louisiana State University, writes to correct a statement which appeared on p. 645 last month to the effect that he is a member of the Royal Society of Arts, London. He desires it to be known that he was invited to make application for membership, but declined the honour.

General Articles.

SOME MEMBERS OF THE ROYAL COLLEGE OF VETERINARY SURGEONS WHO HAVE ACHIEVED NATIONAL DISTINCTION IN COMPARATIVE MEDICINE IN THE UNITED STATES OF AMERICA.

By Dr. ARTHUR HUGHES, Litt.M., Ph.D. (Cornell University). D.V.M. (New York State Veterinary College),

(*Continued from page* 652.)

V.—Austin Peters, M.R.C.V.S.

Of the individuals who compose the group of men whose achievements we are sketching in this article, Austin Peters is the only one American born. His birth took place at West Roxbury, Massachusetts, now part of the City of Boston, June, 1859. After private school work in Jamaica Plain, near Boston, he attended the Massachusetts Agricultural College, Amherst, where he graduated in 1881. At the time of his graduation as Bachelor of Science he carried off several prizes. From 1881-1883 he attended the American Veterinary College, New York City, receiving the degree of D.V.S. and standing third in a class of 22. After a year at Harvard Medical School he went to London to study at the Royal Veterinary College. In 1885 he passed the examinations and was admitted to membership in the Royal College. After private practice with J. W. Gresswell, M.R.C.V.S., of Peterborough, and travels in England and on the Continent, where he visited the veterinary schools at Edinburgh, Alfort, and Berlin (1884-1885), Dr. Peters returned to America and took up his residence in Boston.

Almost immediately his worth was recognized, and he was treated as a favourite son and chosen for State veterinary work. From 1886 to 1891 he was employed by the Massachusetts Society for Promoting Agriculture in investigating contagious abortion in cows and bovine tuberculosis. In 1892-1893 he investigated tuberculosis in the eastern part of the State of New York for the New York State Board of Health. Between 1891 and 1901 he was identified with the militia of the State of Massachusetts, ranking as a captain. In 1896 Peters was appointed to the Massachusetts Cattle Commission by Governor

Roger Wolcott. Of this body he was chairman until 1902. That year a law was passed providing for a Cattle Bureau of the State Board of Agriculture, and Dr. Peters was appointed chief annually, 1902-1910. Nor has this series of successes been unaccompanied with honours, nor has it been barren of writings on veterinary topics. Peters never wrote any books, but he has produced papers on tuberculosis, rabies, dairy inspection, as well as parts of the reports of the Massachusetts Cattle Commission (1896-1902), and he wrote all of the reports of the Cattle Bureau (1902-1910). And he has been a veterinarian loyal to professional organizations—member of the American Veterinary Medical Association since 1883; of the Massachusetts Veterinary Medical Association since its foundation in 1884. He was a vice-president of the Veterinary Section of the International Congress on Tuberculosis, Washington, 1908, and member of the International Veterinary Congress at The Hague, 1909, both of which he attended. He is president of the Eastern Live Stock Sanitary Association and veterinarian and trustee of the Bay State Agricultural Society. In short, from the time he left England in 1886 until the present time his life has been full of good works, uninterrupted successes and honours.

Austin Peters is one of the best-known veterinarians in the United States to-day. What, we may inquire, has given him his reputation? In the manufacturing State of Massachusetts, of little value agriculturally, he has been able for nearly a quarter of a century to hold sway over the minds of the better element in Boston and the eastern part of the State, and by example and precept, as veterinary leader, has shown that conservative old commonwealth the usefulness of veterinary sanitary science to the people. It is all the more to his credit that these people were not predisposed to listen to his advice, nor to heed his caution. His name became a by-word throughout New England for intelligence on veterinary hygiene and obedience to its teachings. He it was also, in 1902, when the disease was fast spreading throughout New England, who diagnosed the presence of foot-and-mouth disease, which had gotten a foothold in Massachusetts, but which was shortly stamped out by the American Government. He has been a beacon of veterinary intelligence where it was much needed, and has stood stoutly for professional conduct of State veterinary affairs.

(To be concluded.)

NOTES ON A TRYPANOSOME FOUND IN A SHEEP TICK, AND ITS PROBABLE CONNECTION WITH THE DISEASE KNOWN AS LOUPING-ILL.

By Major C. F. BISHOP, R.A.

Tynemouth.

The disease known as louping-ill has for many years been the subject of investigations by scientific men, among whom may be mentioned: Fair, Murray, Walley, Gamgee, Goodwin and Robertson, Mathewson, Dr. Hamilton (of Hawick), Williams and Young, Klein, McFadyean, Meek and Greig Smith.

In past years inquiries were made into numbers of possible causes of the disease, such as the influences of sudden changes in the weather, peculiar attributes of the soil, the presence of ergot in the pastures, the presence of keds (*Melophagus ovinus*) and of ticks on the sheep.

About fifteen years ago the theory that ticks had some very close connection with the propagation of louping-ill was rapidly gaining ground, and various forms of bacteria were carefully investigated to ascertain if any of them could be identified as the primary cause of the disease.

In December, 1901, the Board of Agriculture appointed a Committee to inquire into the causes of both louping-ill and braxy, and after four years of careful investigation and numerous experiments, they published, in 1906, a lengthy report in three parts. It is this Committee and their Report, which, for brevity s sake, will be hereafter referred to merely as "the Committee" or "the Report."

The Committee, in their Report, announced that they had discovered, and proved, the primary cause of louping-ill to be a bacillus, to which they gave the name of *Bacillus choreæ paralyticæ ovis*.

The Committee also announced that they had inquired thoroughly into the tick theory and tested it, with the result that they found it to be quite untenable. They dismissed it as a somewhat foolish idea, started by farmers, and founded upon a mere coincidence.

According to the Report then, it was useless to further investigate louping-ill; the whole disease was explained, there was nothing more to be found. However, there still

remained a considerable doubt among some scientists as to whether the Committee had satisfactorily solved the question.

Early this year (1911) Professor Meek, F.Z.S., suggested to me that I should attempt to discover the true cause of louping-ill. He, having studied the disease carefully in 1896 and 1897, was still convinced that the tick theory was the correct solution, in spite of the Committee's adverse decision regarding it, and, when I agreed to make the attempt, it was with the intention of searching for some connection between the tick and the disease, in the form of a protozoal blood parasite, which presumably had escaped the notice of previous investigators. I could only spare time for a few days of work in the field, but hoped to collect enough material for several weeks of laboratory study.

Owing to the kindness of Mr. John Robson, J.P., of Newton, Bellingham, there was no difficulty about getting material to carry out my proposed line of inquiry, although the disease had by no means reached its height at the time.

My idea was, first to get ticks which had gorged themselves with blood from diseased sheep, and specimens of the blood direct from such sheep: then to make smears of the engorged blood from some ticks, and to keep others with a view to examining their eggs, when laid.

Each animal from which material was obtained was registered in my notes as "A" sheep, "B" sheep, &c.; while all smears made from ticks off the sheep were lettered and numbered, as TA1, TA2, TB1, and so on.

On my first day in the field Mr. M. Robson, of Snabdough, showed me what he termed a typical case of louping-ill.

The sheep had been ill for some weeks and was lying with hindquarters paralyzed, so that when lifted to her feet she was quite unable to stand, and fell back at once into her former position. There was no discharge from her nostrils, eyes, or mouth, and no signs of scouring.

From this case I collected, at the time, several ticks, and some smears of blood taken from the bite of an adult tick, but a few days later much more material was obtained from her. She was the "B" sheep of my list.

The first result obtained was when, in examining some slides made of the blood squeezed from gorged ticks, I found one

trypanosome. This single specimen was lying in a good position, apparently in no way distorted, and it had taken up the Leishman's stain excellently in every detail. Its length is 21.75 microns from tip of flagellum to its posterior end; nucleus, central; blepharoplast or centrosome, large and interior to the nucleus; undulatory membrane present and well marked.

Careful examination of the remainder of the slide failed to show any other specimen on it, and it was not until exactly one month later, after about fifty more slides had been examined, that a second trypanosome was found.

Let us consider accurately what we know for certain, and whether there be anything further that we may reasonably infer from these facts.

We know that in a tick taken from a sheep, which was suffering from a disease said to be louping-ill, was a trypanosome. There is reason to believe that the disease was the same as that which was investigated by the Committee as louping-ill:

× 2,250.

the sheep showed symptoms similar to those described both in the report and in the writings of earlier investigators: it was diagnosed as a typical case of the disease as it occurs in the district: and the district, namely, Bellingham, is one mentioned by the Committee as one subject to the disease which they were investigating.

The trypanosome appears to have been in the engorged blood sucked from the sheep, but as the tick was not carefully dissected this is not certain.

There are three explanations of this:—

(1) The trypanosome may have been living its natural life in the tick.

(2) It may have been imbibed from the sheep with blood sucked by the tick.

(3) It may have developed in the tick, from some other form sucked by the tick from the sheep.

The fact that it was a single perfect specimen, with no

recognizable transition or degenerate forms near it, does not much favour any one of these explanations.

Is it likely that the trypanosome has any connection with the disease of the sheep? That the tick is connected with the propagation of that disease?

The symptoms of trypanosomic diseases are very varied, and some of these are at times very similar to the symptoms of louping-ill; for instance, the most characteristic symptom of mal de Caderas is paralysis of the hindquarters, and this disease lasts a few days, weeks, or months.

In ngana and surra, among other symptoms, are fever, emaciation, muscular weakness and paralysis: death occurs in some days, weeks, or months.

The balance of evidence then, so far, seems to be somewhat in favour of a possible connection between the trypanosome in the tick and the disease in the sheep, except for the uncompromising announcement by the Committee, in their Report, that they had carefully tested, and proved—to their own satisfaction—that such a theory is untenable.

On what grounds did they arrive at this very definite decision?

The Committee, in their Report, Section X, Part II, p. 84, say:—

"The fact that louping-ill shows itself about the same time as that at which the tick becomes parasitical on the sheep, has led naturally to the supposition that there may be some ætiological relationship between the two. The evidence, however, is pretty much of the hearsay character; it is lacking in strict experimental confirmation. Ticks abound on sheep where there is no louping-ill, and, conversely, louping-ill is met with, time after time, where neither a single tick is to be found on the carcase nor the slightest vestige of a tick bite."

On the other hand, Meek and Greig Smith, in their "Report on an Investigation into the Cause of Louping-ill," published in the *Veterinarian*, 1896, say:—

"A very general impression amongst farmers and shepherds is that the disease is in some way associated with ticks. Some say that they never saw louping-ill without ticks, nor a place noted for ticks without louping-ill. Reports generally favour such an opinion, though one or two exceptions have been brought forward. Ticks, we imagine, might be present without

the disease; but the evidence for the other case—the disease without the ticks—appears to be very unconvincing. The fact remains, however, that farms and districts noted for the disease are peculiarly rich in the parasite. It might be a mere coincidence; but not only is it true that the tick is a well-known accompaniment, but also that the parasite attacks the sheep in the spring months at the time of the disease, and again if an outbreak occur in the autumn."

Let us turn to the Committee's next objection to the tick theory. In Section X, Part II of the Report is the following:—

"Granted that the tick may act as an intermediary in the dissemination of the malady, there are two possible methods by which the organism may be introduced into the body of the sheep through its agency: firstly, by the tick inoculating the virus through the puncture made by it in the skin; and secondly, by the tick being consumed with the fodder, and in this way infecting the alimentary canal. Against the first conjecture it is to be borne in mind that, whereas microparasites having a morbid tendency, and belonging to the animal kingdom, have been shown in a large number of diseases to be inoculable through the bites of insects, it is doubtful whether a single disease can be traced to this source when the parasite belongs to the vegetable kingdom. . . . It would thus seem that if louping-ill be acquired through the bite of the tick, the disease in this regard would be quite anomalous."

But the anomaly of the Committee only exists if the parasite be vegetable, not if the parasite belongs to the animal kingdom.

The Committee had already made up their minds that no parasite, except the one they had discovered, could possibly be concerned in the disease. If the parasite to be considered be a trypanosome their argument becomes of no value.

It seems quite possible then that the "Tick Theory," combined with an animal parasite as the primary cause of the disease, might well explain the symptoms shown, and the very remarkable fact of the regular appearance and disappearance of the disease at a particular season of the year.

Some of the Committee's experimental work appears to afford very valuable evidence in favour of the tick theory:—

They took some ticks from cases of the disease, carefully examined their internal parts, and found no signs of the *B. choreæ paralyticæ ovis* in them.

Some of the ticks were then mashed up in sterile water, and the mixture administered to a sheep by its mouth. The sheep was none the worse.

Some of the mixture was then inoculated subcutaneously into another sheep. The sheep died of louping-ill.

The Committee came to the conclusion that some of their bacillus must have been attached to the outside of the ticks.

Again, the Committee procured eleven sheep, absolutely clean, from a farm free from louping-ill.

They put four out to pasture on foul land. Three died of louping-ill.

They put one out muzzled, to show that if it could not eat the grass it would not get the disease. It died of louping-ill.

The Committee decided that the muzzle was a bad one.

They then put out six more with better muzzles on, and fed them in a shed at night on turnips and hay; again to show that they would not get the disease. One died of louping-ill.

The Committee decided that the hay must have been contaminated with their bacillus, and argued that had the disease been due to tick infection, there would still be no explanation of why three out of four died when they could eat the grass, while only one out of six died when prevented from eating.

Nevertheless, there is an explanation. The good muzzles are carefully described in the Report as "in the form of a leather cap with breathing holes, enveloping the snout as far up as the eyes, thus completely preventing the animal from eating."

Ask a farmer to get you a tick off a sheep, and he will generally look first round the cheeks, ears, and neck. Now, nearly all the ticks there would have got on to the sheep by its snout, or else directly when its head was bent down into the grass to eat. If, then, you cover the snout with a smooth leather muzzle, you at once close one of the best channels by which ticks gain access to the sheep; also, it is probable that as soon as the animal finds that it is useless for it to try to graze, it will keep its head up out of the grass.

Put gaiters on your sheep, and leather muzzles, and you would probably find a wonderful decrease in the number of cases of louping-ill: the sheep might die of starvation certainly, but that is a side issue.

Meek and Greig Smith tried a better form of protection from ticks, namely, a dressing of obnoxious oils, and allowed the dressed sheep to graze on foul land. Out of seven, none got louping-ill.

But in the Committee's Report there is still another strong argument against the "tick theory."

In Part I, p. 7, we find the following:—

"From the symptoms of the disease, and from the fact of its affecting one animal after another, we suspected, naturally, that the blood or tissues of the body might be the seat of growth of a contagious germ, and the blood, accordingly, was examined with the greatest care. . . . Suffice it to say at present, that after having sought laboriously through case after case for an agent in the blood which might explain the mystery of the disease, we signally failed to detect anything which could be taxed with this significance. . . . So far as the blood is concerned, therefore, the conclusion we arrived at was, that it did not contain any parasite, animal or vegetable, and that it did not differ in any material respect, histologically, from the blood of a healthy animal. We compared, over and over again, the blood taken from sheep in perfect health with that taken from those suffering from louping-ill, and found it impossible to make out any difference between them."

Now, the whole "tick theory" is founded on the belief in a blood parasite. It may be that the parasite is sucked from one sheep by a larva, or nymph, and transmitted to another sheep by the tick when it has changed into nymph or adult respectively; or it may be that the parasite, being imbibed by the adult tick, is transmitted next season by the larvæ hatched out of the mother tick's eggs. But a parasite there must be, or the theory falls to the ground.

Up to the present, although a trypanosome has been found in a tick, all examinations of blood or organs of diseased sheep have failed to show the same form in the sheep.

UNIDENTIFIED DISEASE AMONGST YOUNG CATTLE.

BY T. E. PALGRAVE, M.R.C.V.S.

Department of Agriculture, New South Wales.

So far as is known, this disease has only been observed in the neighbourhood of Benville, Coff's Harbour, North Coast District of New South Wales.

It attacks young cattle from six months of age up to those aged 2½ years, and those in good condition appear more susceptible than those which are poorer.

It may be as well to state that the farmer on whose property the disease exists has lost upwards of 50 per cent. of his young stock during the last three years; that so far no plant has been identified that would cause this loss; and that the disease only appears during a period extending from the early part of September to the latter part of October. It also appears to be more prevalent in dry than showery weather. There is always abundance of paspalum grass as feed, and there is also a quantity of bracken which the cattle do not touch.

Symptoms.—High temperature, often rising to 108° F. or over; rough coat; rather rapid but not laboured breathing; staggering gait behind, as though the loins had been injured; loss of condition; and sometimes, shortly before death, there is a passage of bloody fæces, mixed with thick, stringy mucus, almost like a bowel cast. Occasionally a small sore is found on the muzzle.

A remarkable feature is that the animal will continue feeding right up to the time of its death—even when lying on the ground—and grass has been found in the mouths of dead animals.

Death takes place in from 18 hours to 15 days, which would point to there being an acute and subacute form of the disease.

Post-mortem Appearances.—Petechial markings are generally present in the mucous membranes of the nostrils, vagina, and vulva, but these are not constant; when present, they are about the size of a caraway seed. Ecchymoses on the diaphragm and pleuræ and hæmorrhagic patches (sometimes a single patch) are found on the diaphragm. Slight *ante-mortem* congestion of the lungs and a pleuritic patch on the left pleura; a yellowish effusion in the thoracic and abdominal cavities somewhat similar in colour to that of contagious pleuro-pneumonia. A few petechiæ on

the pericardium, but the heart otherwise normal. Lungs normal, except for the slight congestion already noticed, and the presence of a few ecchymoses on the outside. No marbling of the lung tissue or thickening of the bands of connective tissue. Gall bladder showing ecchymoses on its outer coat, very distended and full of dark viscid bile, in appearance like that found in rinderpest. Ecchymoses present on capsules of liver, kidneys, spleen, and pancreas. The tissues of the last three appear normal on section; that of the liver is bile stained, but otherwise normal. A considerable amount of fatty tissue exists about the trachea, œsophagus, and kidneys, which is stained a bright golden yellow. The cardiac, bronchial, mediastinal, suprasternal, popliteal, and mesenteric lymphatic glands considerably enlarged, deeply red on section, and ecchymotic externally. Bladder and uterus normal, but a large clot of rose-red, jelly-like material lying near the uterus; mesentery and peritoneum ecchymotic. Inflammation of the mucous membranes of rectum and intestines—large and small—that of the rectum being very marked and that of the intestines patchy. Marked ecchymosis of the outer coat of the intestines. A number of large masses of clotted blood present in the large intestine, one mass being fully 6 in. long and occluding the bowel.

The mucous membrane lining the rumen, reticulum, and omasum scraped away easily in large patches, but showed no signs of inflammation; the abomasum appeared normal internally. All the four stomachs contained undigested food and were slightly ecchymotic on their outer surfaces. There were occasional blood extravasations into the muscular tissue of the brisket and abdomen, but they were not marked.

On first investigation this disease was supposed to resemble hæmorrhagic septicæmia, but the following comparison will show that marked differences exist.

Hæmorrhagic Septicæmia.	*Bouville Disease.*
(1) Hæmorrhagic areas in subcutaneous, subserous, and muscular tissues; the areas are of varying size.	(1) Present in a modified degree.
(2) Bloody extravasations in the subcutaneous tissues, usually about lower portion of neck.	(2) Very slight indeed.
(3) Mucous membranes and submucous tissues of mouth, tongue, pharynx, and larynx greatly thickened, inflamed, and infiltrated with serum.	(3) Absent.

Hæmorrhagic Septicæmia.	*Bouville Disease.*
(4) These mucous membranes are reddish-purple, and show hæmorrhagic spots.	(4) No such discoloration, but a very few petechiæ.
(5) Thickening of mucous membrane of trachea and bronchi, and interstitial thickening of the lungs.	(5) Absent.
(6) Diaphragm, pericardium and heart walls show many hæmorrhagic points, and larger bloody extravasations.	(6) Present in a modified degree on diaphragm and pericardium; absent on heart walls.
(7) Sometimes a serous pleurisy with a fibrinous exudate.	(7) Present.
(8) Intestinal submucous and sub-peritoneal tissues show hæmorrhagic spots, large bloody suffusions, or even gelatinous infiltrations.	(8) First two lesions present, but no gelatinous infiltration.
(9) Hæmorrhagic inflammation of intestine, and staining of contents with blood.	(9) Present.
(10) Muscular system throughout shows hæmorrhagic areas.	(10) Present in a modified degree, and not well marked.
(11) Abdominal viscera, liver, spleen, and kidneys often present hæmorrhagic lesions.	(11) Ecchymoses present on capsules of liver, spleen, and kidneys.
(12) Lymphatic glands of neck swollen and infiltrated with blood serum.	(12) All lymphatic glands examined swollen and dark in colour, especially those of lungs and mesentery
(13) Absent.	(13) Intense yellow staining of tissue around trachea, œsophagus, and kidneys.
(14) ,,	(14) Gall bladder very distended, ecchymoses on covering, gall viscid and dark coloured.
(15) ,,	(15) Liver tissue bile stained.
(16) ,,	(16) Jelly-like material in abdominal cavity near uterus.
(17) ,,	(17) Large intestine contains much clotted blood.
(18) ,,	(18) Mucous membrane of rumen, reticulum, and omasum scrapes away readily.
(19) Inoculable by direct method.	(19) Inoculation by direct method has so far failed, as the disease has not been reproduced.

Of course it is possible that the Bouville disease may be reproduced through the medium of an intermediary host, which while not in itself susceptible to the disease may harbour the pathogenic micro-organism—assuming that one exists—and thus transmit the disease to another animal of the same species as that from which the micro-organism was first obtained.

Ticks of various kinds are present in the locality, but up to date the cattle tick which transmits red-water has not been found.

Lung worms have been found in small quantities in most of the affected cattle, but there is nothing to suggest that they act as intermediary hosts. I should be glad if any readers of the VETERINARY JOURNAL, who have come across any disease simu-

lating this one, would publish their experiences. To me the disease is a strange one, and I have been unable to come to any definite conclusion as to its cause; its nature appears to be septicæmic.

SOME DISEASES AND PARASITES OF OSTRICH CHICKS.*

By W. ROBERTSON, M.R.C.V.S.

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ALTHOUGH the continued advance in the price of the ostrich feather has attracted much attention and capital to the industry of ostrich farming, our information upon the diseases of the bird, particularly when in the chick stage, is still very scanty. When men, to whom farming is a new thing, or new as far as ostriches are concerned, start, there are bound to be many mistakes made, and as a result many failures must follow. The great difficulty of the observer is to distinguish between the mortality amongst chicks due to bad management and the mortality due to the ravages of a specific disease. Many men when first visiting a prosperous ostrich farm and seeing the trim breeding camps with their aggressive and well-fed occupants, and hearing that last season's chicks fetched an average of £10, and all this season's are booked (before even the eggs are laid) at a higher figure, are inclined to think that this style of farming is Utopian, and that it is "picking up money." They straightaway invest in high-priced birds and start in chick-rearing; the results are frequently disastrous.

It is not my province, nor my intention in the present instance, to deal with the subject of chick-rearing; every district and every farm, let alone often every man, has his own idea on this matter. But there are certain broad principles common to all, and it is not out of place to make some slight mention of them before dealing with one or two of the chick ailments which have come under my notice during the past two seasons; and though the work in their connection has been fragmentary and inconclusive, I think that what knowledge is at hand should be placed at the disposal of the new industry, as it

* From the *Agricultural Journal of the Union of South Africa.*

is only by extensive experiments (impossible in a laboratory) carried out by the farmer himself that we can learn how the theoretical experiment will work out in practice. Many men taking up ostrich-breeding and having in view the rearing of chicks for sale, and to strengthen their feather flock, mate unsuitable birds; I say unsuitable for mating, though they may both be first-class birds. I take it that the position is just this: the average ostrich is no more pure bred than the ordinary horse, and any farmer knows what is the result of breeding from half-bred stock as far as results are concerned, and how very unlike either parent the progeny may be. To take another simile: if one were to mate a white barn-door cock and a white barn-door hen, the eggs would hatch piebalds, white, blacks, &c., *i.e.*, the progeny were displaying the trait called "atavism," or throwing back to some earlier ancestor. But if you bred the selected white chick along the same lines, always selecting those likest the type you wished to produce, in time you would get a breed from a pair of which you might reasonably hope to get a fair percentage of chicks reproducing the parent type. So in the ostrich; you can mate a fine cock and a fine hen, and get chicks which are absolutely rubbish, but certain breeders have now so bred from certain strains that the greater percentage of their chicks throw true to parent type. Again, certain strains will, as the breeder says, "nick" with each other, and this should be borne in mind when selecting pairs, otherwise you get the chick not only mixed in quality, but many may be inferior to the parents.

Hatching.—I must here say a few words on this, as on the constitution of the chick depends his fitness to survive the troubles of his early life. Natural hatching, under a shelter, is no doubt the best plan; but as a bird starts sitting after laying the clutch of eggs she can cover, a man who has given a long price for a pair of birds wants more eggs from the pair than this. The usual plan to adopt is to take the eggs away as laid, transfer to the incubator or other hen, and allow the hen to sit on her second or third nest. Personally I think it is a great mistake to let a hen have three nests in one season. The chicks of the last eggs are often unfertile, and it stands to reason that the chicks cannot be so sturdy or start life with the constitutions of those off the first nest, when the parents were

in the vigour of the early mating season. I also think it is wrong to excite a cock bird's sexual appetite with such drugs as cantharides, cayenne pepper, &c., *for a prolonged period of time*. A few doses at the commencement of the season may make a backward bird pair and start the breeding, and do no harm, but it is this continual excitation of the sexual functions that I think is useless. You can certainly increase the frequency of the sexual act, but you cannot increase the percentage of fertile eggs by that method.

Breeding pairs are generally camped off in May, and by the end of that month may have nests. The plan is to feed heavily until the hen starts laying, then reduce rations a little. Personally I think from what I have seen that too fat parents produce a large percentage of unfertile eggs, and I do not like to see too fat *breeders* camped off.

Chicks.—Chicks begin to appear about the end of May or even earlier, and the best chicks are those which get a fair start before the cold weather of August commences. The most successful chick-rearers never give the newly-hatched birds food for at least twenty-four hours. The yolk sac of the ostrich persists for nearly ten days after the chick has hatched, and affords quite enough nourishment for the first twenty-four hours of the creature's existence. It is also the persistence of this yolk (or yelk) sac which accounts for the chrome-yellow-coloured liver of the young ostrich chick.

Chicks should have as much sun and light and air as possible. Cold will not hurt them, and they stand a lot of rain. Wind is their worst foe. When this blows they simply lie down and refuse to feed, and dwindle away. The most critical time for chicks is at fourteen days old, over that they go ahead.

Administration of Medicine to Chicks.—Ostriches are comparatively easy things to dose; their œsophagus is big, and the risk of choking (provided care is taken) infinitesimal. Liquid drugs are generally given from a small narrow-mouthed bottle, and solids in the form of pills. I have lately used with much success as a medicine vehicle the gelatine capsules in which are wrapped horse-balls (similar to the gelatine capsules of the human pharmacist on a large scale). These are neat, clean, and easy to administer; there is absolutely no danger of choking, and the dose can be made ready. It is somewhat of an under-

taking when one has to dose, say, eighty chicks with oil on a cold morning; the oil does not completely leave the bottle, runs over the neck, and the result is each chick does not receive exactly the dose we want it to. With capsules, the lot can be charged the night before and remain ready for the morning. They are worth a trial by ostrich men, and are very cheap.

Dronkziekte in Chicks.

Here the chicks seem to lose the power of maintaining their balance (quite distinct from paralysis); as it is termed, loss of co-ordination of movement. Generally seen in chicks from two to six months old; they seem to stagger, stand on tiptoe, and to be continually on the verge of falling forward, and using the half outstretched wings as a balance; feed well, and are often very fat. Sometimes only a percentage of the batch are affected. The attack appears suddenly, and does not appear to spread from bird to bird.

This affection is a very annoying one; it throws chicks back in condition just at the critical growing and developing time of their lives. If chicks two or three months old get anything the matter with them they never seem to grow out, and are always stunted and undersized all their lives.

Cause.—I have not had much experience with the treatment of this disease; the seven outbreaks I have seen have been at such distances from town that personal supervision and the studying of the effects of various drugs was impossible. *Post-mortem* shows the body to be absolutely normal, and opinions are divided as to the actual cause of the disease. It may be due to some strain in the birds' breeding, producing nervous lesions in the brain, or due to the direct effects of some specific germ. It is difficult to accept the vegetable poison theory, as only a percentage out of a lot running together show the symptoms.

Treatment.—In the few outbreaks where I have been able to give the matter personal supervision I found good effects from the administration of a purgative, followed by repeated doses of a nervous sedative.

Case I, February 18, 1911.—A farmer in the neighbourhood called *re* above disease in his chicks; had about twenty in a lot of fifty affected; gave two lots of pills, one containing aloes barb. gr. x, the other chloral hydrate gr. xx, with instructions to

give the aloes pills first and then follow up with daily dose of the No. 2 pill.

February 21, 1911.—Visited the farm and saw chicks; owner says they are better; no more sick.

February 25, 1911.—Saw chicks again; those which were affected are all doing splendidly, but are going to be stunted in growth, having received a check or set back, and will never probably grow out to the same size as their contemporaries; the feathers of the affected chicks without an exception show a deep distinct " bar."

Ophthalmia in Ostrich Chicks.

During the past season several breeders have been troubled with a variety of ophthalmia in their chicks and half-grown birds. The disease starts somewhat suddenly and is undoubtedly infectious. At first there is blinking of the eyelids, a flow of tears, and in a couple of days the lining membrane of the eye becomes inflamed and angry-looking, the lids are kept closed, and the watery discharge (in some cases) changes to pus, which glues up the eyelids. On forcibly opening them the eye is full of a thick sticky material, and the eyeball itself is blue and blurred. If left untreated, or treated improperly, several things may happen, and the sight of the eye may be lost or permanently impaired. After recovery one can often notice which birds have been affected by the puckering of the eyelids.

Infectious Nature of the Disease.—Observations, and the opinion of the farmer, pointed to the infectious character of the disease. In order to settle it I carried out the following experiment: Three ostrich chicks, four months old, were confined in a pen which had never before held birds. A swab of cotton-wool was then taken and rubbed over the eyelids of an affected bird and transferred to the eyes of the clean birds. Ophthalmia appeared on the morning of the fourth day in all three. This experiment was repeated and gave identical results.

Treatment.—As soon as the disease appears the farmer must isolate the affected bird, and dress, not only it, but all the rest of the flock. I have seen an outbreak cut short by careful daily dressing of all the in-contact birds. I have tried many remedies, including sulphate of zinc, boracic acid, lead lotion, ointments, &c., and find the best results to follow the free use of a

weak solution of corrosive sublimate in water, 1 to 1,500. I use an eye-dropper, or an ordinary fountain-pen filler will answer very well, and at first the dressing should be carried out twice daily. Run the bird into a plucking box, catch them by the lower jaw, turn the head on one side, and drop in about ten drops of the solution, let the superfluous liquid run out around the eye, dress the other eye similarly, and let go.

So far this treatment has been an unqualified success. Care must be taken with the lotion, which should carry a poison label. I will just give in detail the course of an ordinary outbreak: Mr. H. M., farmer, near Grahamstown, when seen, had thirty chicks affected. First symptom noticed was swelling of the eyelids, which rapidly became distended with a clear fluid (subsequently purulent), a purulent exudate appeared along the inner edges of the eyelids, in many cases gumming them together. Nine of the chicks were four months old, the remainder varied from six to nine. There appeared to be much irritation and pain, the birds were constantly shaking the head and rubbing the eye on bushes, fences, and one another. The owner thought the chicks contracted the disease from sleeping in low-lying river paddocks, and suggested as a direct cause the "bites of insects," mosquitos, &c. These birds were treated twice daily with 1 in 5,000 watery solution of perchloride of mercury; the results were very satisfactory. Several were not treated; in these the disease ran its course in about twenty days; one chick lost the sight of one eye, in others the eyelids showed marked and lasting irregularities; the eyelashes were twisted, and there was marked puckering of the skin of the orbit, and even after a lapse of four months the eye lesions can be noticed in the untreated birds, though all inflammatory changes subsided three months ago.

I have met with several cases of blindness and defects in sight in old birds, directly traceable to a previous attack of ophthalmia.

Eversion of the Rectum in Chicks.

This should more correctly be termed, Eversion of the Cloaca, the end of the gut.

This is a somewhat common complaint, and in some seasons assumes the nature of an epidemic. The course of the disease is often very rapid, and the mortality assumes a high percentage.

The disease principally affects chicks of a few weeks old, but I have seen several cases in old—even in a sitting bird. It commences by a straining, and wetting of the feathers around the anus, which are soiled with the discharge. There may, at this stage, be some slight protrusion of the gut; this gets more pronounced, until a piece the size of a sausage appears, and may even get so large that the chick can tread on it. I have seen it in a month-old chick assume the size of a large oval orange.

Treatment.—In the advanced stage little can be done. I have replaced the gut after bathing in alum and warm water, and kept it *in situ* with a stitch "figure-of-eight fastening," from skin to skin across the rectum. As soon as a case is noticed I advise getting the following made up at the chemist's: No. 1: gelatine capsules, each to contain castor-oil half an ounce, and sandal wood oil half a drachm. Get as many doses as you have chicks and give at once, next day, and for the two following days, *i.e.*, three doses in all; Pill No. 2: each to contain powdered opium 25 gr., prepared chalk 30 gr., and powdered ginger 20 gr.

I am of opinion that the cause is some irritant in the urine (the bird has a common orifice for the evacuation of the contents of kidney and bowel). This irritant acts upon the soft mucous lining of the end of the gut (the chick is growing fast and the tissues are soft and yielding and not set), causing much straining, a small part protrudes, the muscle at the orifice of the anus then contracts and confines that piece into which blood comes and cannot get back, it swells further, more gut is protruded, and so on.

I am very satisfied with this treatment; it is worth a trial.

Parasites in Ostrich Chicks.

The external parasites of ostrich chicks affect them and us very little, and it is the internal, or intestinal parasites, which cause often serious mortality, and always much loss of condition.

It cannot be too often urged that unless chicks have a good start they will be more or less handicapped for the greater part of their career, both in regard to constitution, size, and feather production. Professor Duerden has shown most clearly that *any set-back to a bird can produce a bar or irregularity of growth*

in the feather at that time; and I think that the often defective tips in spadonas and first after chicks are due to the presence of internal parasites. The chick, at the early stage of its existence, is growing very rapidly, and cannot grow out and develop in the way it should when its constitution has to support, in addition, a mass of tape-worm, or even wire-worm.

Tape-worm.

I have heard a breeder say "All chicks have tape-worm." That is not strictly correct, but tape-worm is more or less a disease only affecting young birds. It is rare to find a full-grown bird so affected, but I have seen the gut of young birds so full of the parasite that it was a matter for wonder how even the food managed to pass along.

The tape-worm of the ostrich (*Tænia struthionis*) belongs to the class of parasites which require two animals or hosts for their complete life cycle, just as in the case of the tape-worm of man; there the worm is voided and picked up by the pig, in whose body it develops into the little bladders called measles; man eats this flesh, and in his body these bladders again grow into worms. In the case of the ostrich tape-worm we do not yet know what is the other animal through whose body the parasite must pass to complete its life cycle, and when one thinks of the immense number of animals in the veld who might act as this intermediary bearer (as it is termed), the search will doubtless be a long one.

Age at which the Chick becomes Infected.—Ostriches can, and are, reared without ever becoming infected with tape-worm. This sometimes occurs on veld new to ostrich farming. There, no doubt, the intermediary bearer, if it exists, is still uninfected; but sooner or later a fresh batch of chicks is brought and starts the parasite.

I have found chicks as young as three weeks well infested with the parasite, and from that age on to maturity, say two years old, they are the commonest parasite of young birds.

Symptoms.—If conditions are good and the food plentiful the birds can nourish both their own constitutions and the tape-worm's, but if the food ration falls, climatic condition becomes unfavourable, or the chick becomes ill, the parasites are served first and the bird's constitution suffers. The symptoms are those

of general ill-health, paleness of the mucous lining of eye and mouth, and the presence of expelled portions of the worm in the dung; this, of course, is the best and only certain symptom. These *nits* as they are termed are the ripe segments from the hinderpart of the body of the tape-worm, and are in reality simply sacs of eggs, and are always found on the outside of the dung pellets, having been brushed off from the parasite's body in the passage of the dung through the bowel.

Treatment.—The removal of the tape-worm is simple enough and accompanied by very little danger. For their eradication I find nothing so good, certain, and safe as *Petrol—Motor Car Spirit, Pratt's Green Label.* Care must of course be exercised in the dosing; a drop of petrol—or for the matter of it almost any liquid—down the bird's windpipe will be accompanied by serious and often fatal consequences.

In drenching birds it is always advisable to cover the opening in the windpipe with the fingers of one hand, and pass the bottle over them; it is also well to hold up the bird's head after drenching for a few minutes. Some birds possess the power of inverting the neck and regurgitating fluid from the stomach; this, if it runs into the mouth, may also run into the windpipe and choke the bird. Petrol is not poisonous in anything like reasonable doses. For instance, I have given a two-year-old bird a wine-bottle (27 oz.) daily for fourteen days, and a six-weeks-old bird 10 oz. daily for a similar period of time without producing any ill-effects. I find an occasional dose of petrol to chicks of marked benefit, and its use is very widespread in the ostrich-breeding districts, where some men I know dose every six weeks as a regular thing.

I am of opinion that tape-worms do more harm than we think, and injure the bird in other ways than by merely abstracting so much nourishment from the body. Wherever a tape-worm attaches itself by its row of hooks it makes an actual wound in the bowel wall; this makes a breach in the body's defences for the inroad of germs from the bowel, and I believe that this is the way some of the ostrich chick epidemics start. I have counted in one ostrich of nine months old over *two hundred tape-worms,* the aggregate weight of which was nearly *three pounds,* and the amount of nourishment necessary for their subsistence must have been considerable.

In experimenting with petrol I find the following list of doses quite safe; in several instances much more can be given with safety, but was, I take it, simply wasted.

It is advisable to fast chicks a little before dosing, but if they are at all weak or thin do not starve for the first dose. The petrol being volatile at a temperature lower than the bird's body speedily becomes vapour, and penetrates through the whole of the bird's intestinal tract in a remarkably short space of time.

Dose of petrol, given pure:—

1 and 2 months old	birds get	... ...	½ oz.
3 ,,	,,	... ...	1 oz.
4 ,,	,,	... ...	2 oz.
5 ,,	,,	... ...	3 oz.
6 ,,	,,	... ...	4 oz.
7 to 11 ,,	,,	... ...	5 oz.
12 ,,	,,	... ...	6 oz.
Full-grown	,,	... ...	8 oz.

It is emphasized that the petrol must be given *pure*, not mixed with water.

Wire-worm or "Vrot-maag."

This parasite, and some notes on its life history, have been dealt with in the *Cape Agricultural Journal*, August, 1910. I am still of opinion that the best method to eradicate these parasites is by repeated dosing with lime and sal ammoniac. I have dosed at three weeks' intervals (with a preliminary dose of paraffin) without any ill-effects on the bird's constitution, and with most beneficial results in regard to the wire-worm, for twenty-seven weeks, i.e., nine times, simply to prove to my own satisfaction that the dose had nothing in it deleterious to the bird's constitution, and that there was no harm in repetition. It is useless to attempt to get rid of this parasite by one or two doses, and the golden rule for a breeder on a farm where wire-worm (*S. Douglassi*) is rife is watch your chicks and dose before they get too bad. If you wait until they are down in condition some will certainly die, whatever you dose with.

Symptoms.—These have already been gone into; the bird goes off condition, the subcutaneous tissue and skin becomes white, instead of the golden yellow colour seen in healthy birds, the mucous lining of the mouth and eye socket become pale and white, and there is often an abnormal amount of chalky deposit in the dung.

Post-mortem Appearances.—The wire-worm is only met with in the upper part of the stomach (see article "Notes on some diseases of the Ostrich," *Cape Agricultural Journal*, January, 1910), hence the difficulty of eradicating them. They are small and hair-like, and often require some searching for before they can be demonstrated. If the infestation is a bad one, the worms by their irritation cause the lining of the stomach to throw out a thick paste, like starch; this gives the stomach a curious appearance, sometimes called "*Vrot-Maag.*" In such a case this exudate must be scraped off before the worms can be demonstrated. It must be borne in mind that the gastric juice of the stomach rapidly dissolves the wire-worm once the bird is dead (and the parasite also), and a bird dead from wire-worm may not show a single parasite if the body is left lying overnight. I have demonstrated this several times thus: kill a bird badly infested with wire-worm, open the stomach sufficiently to demonstrate the presence of the parasite, then close up the stomach and return to the body in twelve hours; you will then be unable to demonstrate the presence of a single wire-worm in that bird's stomach.

One fact I have noticed, and ostrich men are of the same opinion, that a bird badly infested with wire-worm is very disinclined to eat mealies, and, if a bird goes off this kind of feed, that their presence must be suspected. Perhaps the digestion of mealies gives the bird pains under such conditions.

Treatment.—The doses of sal ammoniac and lime, with the preparatory doses of paraffin (to remove the coating from the stomach), have been printed in the *Cape Agricultural Journal*, and leaflets of the dosages can be obtained on application to the writer at the Veterinary Laboratory, Grahamstown.

The full details then published are as under:—

Preparatory Paraffin Dose.

6-weeks-old birds	4 drms. or ½ oz.
2 months ,, ...	6 drms. or ¾ oz.
10 weeks ,, ...	8 drms. or 1 oz.
3 and 4 months ,, ...	2 oz.
6 ,, ,, ...	4 oz.
9 ,, ,, ...	6 oz.
12 ,, ,, ...	8 oz.
18 and 24 ,, ,, ...	12 oz.

Put the birds in a kraal in the early morning, keep without food all day; at night, say five p.m., give the dose of paraffin; still starve until next morning, and then give the lime and sal ammoniac:—

Four-months-old birds and under, as much as will lie on a shilling of each.

Six-months-old birds, a small teaspoonful of each.

Nine-months-old birds, a heaped teaspoonful of each.

Twelve-months-old birds, a half-ounce of each.

Full-grown birds, 1 oz. of each.

The small doses can be given in, say, 4 oz. of water each, and increased up to 13 or 15 oz. for the full-grown doses.

The lime does not dissolve, and must be given mixed with the water. I have two bottles with a dose in each and drench in quick succession, employing the usual precaution to avoid getting anything into the windpipe. I have given as much as 2 oz. each of lime and sal ammoniac, and though the bird certainly seemed distressed, it was more due to the mechanical evolution of ammonia gas than the chemical effect of the drugs. The effect of the medicine is very slight, and soon passes off.

After the doses of lime and sal ammoniac give the birds a few mealies or a little chopped greenstuff. Do not let them out into a field of lucerne or rape, else they are apt to over-gorge themselves after their fast.

The lime is ordinary slaked lime, which I pass through a sieve to remove stones, &c. This dose can be repeated in a fortnight.

If by accident an overdose of this sal ammoniac and lime is given, it will be well to give an ounce of whitening in a bottle of water.

Dosing Birds.

Though an ostrich has a neck and throat like a six-inch drain-pipe, he requires some care and precaution in dosing. The following remarks are not intended for the expert ostrich farmer (to whom I am indebted for most of my information on the subject), but to young beginners who are carrying out the "back to the land" axiom now the ostrich industry is yielding such a golden harvest.

When possible, always precede the wire-worm dose by some cleansing substance to remove the sticky covering (which pro-

tects the parasite) from the stomach walls. Petrol or paraffin are both good.

If possible, dose on an empty stomach; the drug loses much of its value when mixed with a stomachful of food.

Use a suitable bottle, varying with the size of the birds. I find a nice series to be—a castor-oil bottle, a small Van Riebeek bottle, and a long-necked Drakenstein bottle.

Tin bottles with an air-hole are on the market. I do not fancy them; the mouth gets rough and the finger slips from the air-hole, and one gets the drug over the face and clothes.

Stand in front of the bird, keeping clear of the legs; have a boy to each wing, and see they grasp the root of the wing and the body—I have seen a bird ruined by a wing becoming dislocated as the result of pulling on the tip. Then seize the bird's lower jaw with the left hand, shove the first, second, and third fingers over the opening of the windpipe in the floor of the mouth, the thumb being under the lower jaw. Slip the neck of the bottle over the fingers and well down the gullet, empty and withdraw the bottle, hold up the bird's head for a second or two, as some of them possess the power of inverting the beak and literally pouring the medicine out of the stomach, or rather the lower part of the gullet.

STATE EXAMINATION OF STALLIONS IN NEW ZEALAND.

A Bill is to be introduced by the New Zealand Government to provide for the compulsory examination of stallions. At the last Conference of the Agricultural and Pastoral Association, held in August, the following synopsis of the Bill was given to the delegates by the Chief Veterinarian (Dr. C. J. Reakes):—

"The Bill not to apply to stallions over two years old at the time it becomes law. Thus, when it is passed only those stallions which are one or two years old at the time would be subject to its operation; and, seeing that in practical working it is unnecessary to examine horses for hereditary unsoundness until they are three years old, time would be given to arrange the necessary machinery for carrying out the provision of the Bill before these animals reached the age of three years. Provision is made, however, for the owner of any animal over two

years old to voluntarily submit it to examination if he wishes. Thus a year after the Bill is passed all three-year-old horses will have to submit to examination; the following year these horses will again come up for examination as four-year-olds, together with the three-year-olds of that year; and a year later, three, four and five-year-olds will have to be examined, and so on. It is proposed that the licence shall have to be renewed yearly up to the age of six years, the horse being subjected to examination each time; that a licence granted at six years old shall remain current for two years, the horse being again submitted for examination at eight years of age; then the certificate of licence granted to eight-year-olds shall remain current for the rest of the animal's life, unless special circumstances should render it necessary to later call it up for further examination.

"Provision is made under which animals imported from Great Britain, Australia, or other countries may be examined before purchase by veterinarians especially appointed for the purpose, whose certificates will be accepted here as being equivalent to the certificates of New Zealand Government Veterinarians.

"All examinations in New Zealand are to be conducted by two Government Veterinarians acting in concert. Provision is also made for a right of appeal in the event of an owner being dissatisfied with the decision of the examining veterinarians. The schedule of diseases classed as being of an hereditary nature is as follows: Bone-spavin, ring-bone, side-bone, navicular arthritis, laryngeal muscular atrophy causing roaring or whistling during the act of inspiration, stringhalt, shivering, and an inferiority in the structure or quality of the hoof which impairs or is likely to impair the animal's usefulness, and is in the examiner's opinion transmissible to the progeny.

"I have a number of draught copies here of a suggested Bill which are at the disposal of delegates to this Conference, and I shall be pleased to receive any comments upon this, also any suggestions regarding it." This Bill, Mr. Reakes said in conclusion, he had endeavoured to make practical, and hoped that from the copies circulated delegates would have made themselves familiar with the proposed measure. The time had come when purchasers demanded that animals should be free from hereditary unsoundness.

A motion, "That it is desirable Mr. Reakes' Bill be passed this Session," was carried unanimously.

BOARD OF AGRICULTURE AND FISHERIES.

King's Premiums and Super-premiums for Thoroughbred Stallions for 1912.

Attention is directed to the following important alterations in the premium regulations for the Show of Thoroughbred Stallions which is to be held in London on March 12, 13, and 14, 1912:—

(1) In lieu of a travelling fee of 10s. 6d. for each mare served a sum of 50 guineas will be paid to the stallion owner after the close of the season on production of a certificate that the stallion has regularly travelled the district for which it was awarded a premium.

Super-premiums.

(2) Super-premiums (*i.e.*, an award of 100 guineas in addition to the ordinary premium) will also be given to stallions of exceptional merit, but not more than ten will be awarded in 1912. The owner of a stallion is required to state in the entry form whether he enters his stallion for competition for a super-premium. If he does so enter it, he is to sign an undertaking agreeing to exhibit the stallion (if awarded a super-premium in 1912) at the Show of Premium Stallions in 1913 in a class for which it is eligible, in accordance with the regulations of the Board.

If he fails so to exhibit the stallion he is to forfeit and pay to the Board the value of the super-premium, *i.e.*, 100 guineas.

(3) Exhibitors may enter any number of stallions in each class, and may take all premiums awarded to them.

(4) The last day for entry is Monday, January 29, 1912, and for post entry Monday, February 5, 1912.

(5) Every stallion must be registered under the Board's registration scheme before it can be accepted for entry.

The registration year is November 1 to October 31, and re-registration will only be undertaken between November 1 and March 1.*

(6) A stallion will not be registered or retained on the register unless it is certified to be sound and suitable for breeding purposes, and is free from the following diseases and defects:—

* Application for the registration of stallions to be entered for 1912 show should be made not later than January 1, 1912.

Cataract, roaring, whistling, ringbone, sidebone, bone spavin, navicular disease, shivering, stringhalt, and defective genital organs.

(7) No veterinary examination will be made at the Show.

(8) A stallion to which a King's premium is awarded is to *travel* as the Board may direct, *i.e.*, no stallions will be allowed to *stand* in 1912.

Copies of the revised regulations for the registration of stallions can be obtained on application.

T. H. Elliott,
Secretary.

TWO CASES OF HYDRONEPHROSIS IN THE DOG, CAUSED BY CARCINOMA OF THE BLADDER AND ACCOMPANIED BY PROSTATIC HYPERTROPHY.

By JOEST.

Case 1.—Ten-year-old St. Bernard dog died from urinary trouble. The left kidney is 12 cm. long at the hilus, 4.5 cm. broad, and 3.5 cm. thick; the right kidney is 11 cm. long, 3.5 cm. broad at the hilus, and 3.5 cm. thick. On palpation of both kidneys, but especially the right one, fluctuation could be detected at the hilus. The ureters are distended as thick as one's thumb throughout their whole extent and show intense fluctuation. The bladder is as large as a goose's egg and very hard. The tumour is situated on the dorsal bladder wall, and projects into its lumen, stretching from its summit to its neck and also meets the openings of the ureters. The mucous membrane of the bladder is rough, uneven and ulcerated. Urine from the ureters can hardly be pressed into the bladder. The prostate gland is enlarged and each lobe about the size of a pigeon's egg and of hard consistence. Histological examination of the tumour showed it to be an epithelial carcinoma.

Case 2.—A four-year-old setter dog had died. Inside the bladder in the dorsal wall there was a flat tumour half the size of a hazel nut, with an ulcerated surface. The bladder was empty and about the size of a hen's egg. The prostate was enlarged. Both ureters were distended as thick as one's little finger, and the kidneys were dropsical (hydronephrosis). Histological examination of the tumour showed it to be an adenocarcinoma.

In both cases the tumour obstructed passage of the urine from the kidneys to the bladder. The prostatic hypertrophy was a disease in itself.

(*From the Report of the Royal Veterinary College in Dresden*, 1910.)

Clinical Articles.

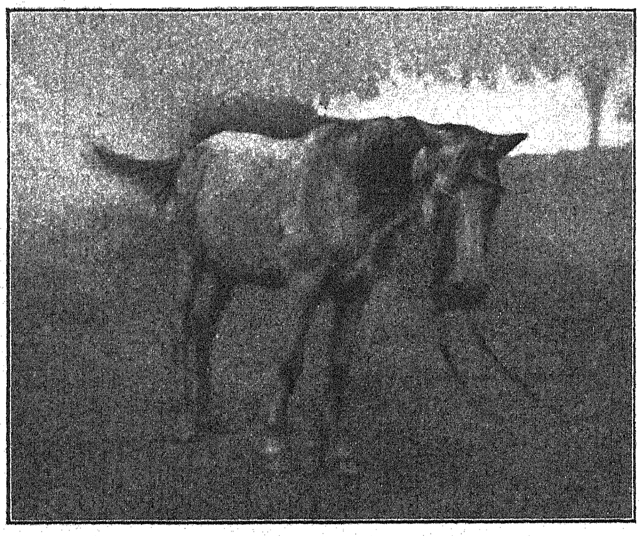
A CASE OF MELANOSIS IN THE HORSE.

By FRANK CHAMBERS, M.R.C.V.S.

Government Veterinary Surgeon, Umtata, South Africa.

During a visit in the district a few months ago I came across one of the most advanced cases of melanosis it has ever been my fortune to see.

The subject was a thirteen-year-old grey gelding in fairly good condition. The accompanying photograph gives a good idea of the enormous deposits of melanin in the various parts of the body. By far the greatest enlargements were in the parotid region on the off-side, the near-side being also affected. The



Photograph showing the position of the tumours.

presternal, precrural, popliteal and other glands were also affected. In fact, the horse appeared one mass of lumps. The owner was ignorant of the cause, and said that the condition had been gradually getting worse for six years. A special bridle had to be made for the horse on account of the enlargements at the base of the ears. The animal seemed in very good health, and did his work to the entire satisfaction of the owner.

A BRAIN CASE.

By Captain A. J. WILLIAMS, F.R.C.V.S., A.V.C.

Mounted Infantry School, Longmoor.

Subject.—A Mounted Infantry cob, age 14 years.

History, &c.—On December 28, 1909, the mare was suddenly taken ill whilst being led at exercise. There was marked staggering gait, and she was brought back to the stable with difficulty.

I found her leaning to the off side, resting aginst the stall partition, a slight frothy discharge from both nostrils, pupils normal, nervous expression. When moved there was marked inco-ordination of movements and an ataxic gait. The near fore was thrown out spasmodically, and the foot put to the ground in a peculiar feeling manner, as if uncertain of the distance; similar symptoms in the near hind.

All symptoms increased when first moved after a short rest; inclination to fall to the off side, worse when blindfolded; when reined back inclined to fall and staggered backwards, trembling of the muscles over the near shoulder. Pulse 60 and irregular.

December 29, 1909.—Paraplegic symptoms pronounced this morning. Plaits hind legs, ataxic gait and loss of co-ordination, especially marked when turning, nervous expression.

January 7, 1910.—Much improved, only slight paraplegic symptoms remain. Walking exercise for half-hour daily.

January 14, 1910.—Continues to improve. Exercise increased. On the 20th improvement maintained and exercise increased to two hours daily.

January 31, 1910.—Discharged cured.

Treatment.—A purgative was given when the case was admitted. Afterwards salines to correct any tendency to constipation. Pot. iod. ʒj twice daily from time of admission till paraplegic symptoms disappeared.

Remarks.—The case was diagnosed as cerebral hæmorrhage, from the suddenness of the attack and the general symptoms, hemiplegia followed by paraplegia. The animal has remained perfectly fit since she was discharged, and has done regular work up to the present time.

IMPACTION OF COLON DUE TO ABDOMINAL ABSCESS, WITH RUPTURE AND DEATH.

By C. W. TOWNSEND, F.R.C.V.S.

Long Stanton.

THE subject of the above note was a very good three-year-old Shire gelding, the property of a farmer.

I was called in to attend him one evening in November last; upon arrival I found the animal showing symptoms of abdominal pain. I diagnosed the case as one of impaction of the colon; examination *per rectum* verified my diagnosis. The usual treatment for this condition was adopted. The animal responded to treatment within the next twenty-four hours, by which time a fair amount of fæces had passed. As he appeared to be progressing favourably, I did not call again, but left word to send for me if required. Upon the third day from the first attack I was again requested to see the animal. Upon my arrival I found him exhibiting symptoms very similar to those shown during his first attack, but now of a more serious nature, viz., full quickened pulse, hurried breathing, temperature 105° F., injected visible mucous membranes, anxious expression, abdominal pain intense and persistent; no fæces had been seen since the morning. From the above symptoms I naturally concluded I had now something more than impaction of the colon to deal with.

Although I tried practically everything to alleviate the animal's suffering, death took place on the fifth day from the first attack.

Post-mortem Examination.—Upon cutting through the skin in the region of the scrotum, which latter appeared slightly swollen on the near side, I discovered a quantity of yellow inspissated pus.

Upon opening the abdominal cavity a quantity of pus was more or less mingled among the abdominal contents. On the same side as the swollen scrotum, at the entrance of the internal abdominal ring, I found upon examination the remains of a big abscess cavity with darkened walls, in the sac of which there was still some foul smelling pus.

Remarks.—I record this case not so much because of the

symptoms shown, but because of the result of the *post-mortem* examination.

During the first attack the animal showed no symptoms by which one could distinguish the case from that of an ordinary attack of impaction of the bowels. During the second attack it was practically impossible to correctly diagnose the case, as by the time I saw the animal it was more or less in a state of collapse.

The above case, to my mind, only shows the necessity for making *post-mortem* examinations whenever possible, and especially in those cases of so-called fatal colic. In the above case, no doubt, if a *post-mortem* examination had not been made, the cause of death would have been attributed to rupture or twisted bowel.

As to whether the pus was streptococcic or not I am unable to say, as, being very busy at the time, I was not able to microscopically examine it. I have frequently wondered, however, since the case happened, whether the abscess was the result of a previous attack of strangles; I could, however, find no history of this having previously occurred. The owner informed me, however, that the horse had not been doing well for some time previously.

As regards the abscess itself, no doubt its presence and the position it occupied accounted for the first attack of impaction; quite possibly during this attack the impaction pressed upon the abscess to such an extent that it caused the abscess to become suddenly enlarged, the rupture itself taking place during the second attack.

STERNAL FISTULA IN A HORSE.

By J. J. O'CONNOR, M.R.C.V.S.

Professor in the Royal Veterinary College of Ireland, Dublin.

Subject.—An aged brown trooper, in poor condition.

History and Symptoms.—A sinus of long standing abutting on the carinaform cartilage of the sternum, which did not respond to antiseptic irrigations.

Treatment.—On the same lines as the former case, and as a result of which the horse made a complete recovery.

SINUS IN THE LOWER JAW OF A HORSE.

By J. J. O'CONNOR, M.R.C.V.S.

Professor in the Royal Veterinary College of Ireland, Dublin.

Subject.—A six-year-old chestnut trooper.

History.—Had been affected for months with a sinus extending into the right horizontal ramus of the lower jaw for a distance of about 2 in. and opening on its lower edge (head horizontal). The condition resisted ordinary antiseptic treatment.

Treatment.—I cast and anæsthetized the horse, and incised the skin parallel to the long axis of the ramus for a short distance in front of and behind the orifice and reflected it from either side of the latter; vigorously curetted the lining of the sinus, until a large gaping opening was made in the bone; swabbed the wound with tinct. iodi. and plugged it with sterilized gauze, impregnated with pure iodoform powder. After treatment consisted in washing with antiseptic lotion made with sterilized water, swabbing with tinct. of iodine, and powdering with iodoform until the wound became uniformly covered with granulations, when the iodine was discontinued and mere dry dressing or astringents applied as seemed necessary. Recovery was uninterrupted, extending over a period of about two months.

TRACHEOCELE IN A HORSE.

By J. J. O'CONNOR, M.R.C.V.S.

Professor in the Royal Veterinary College of Ireland, Dublin.

Subject.—An aged high-class hunter.

History.—The horse had a tracheotomy tube in for the past twelve months, and recently he damaged the tube by rubbing it against the stable door, necessitating its being sent away to be repaired, another tube of a different, obsolete pattern being employed in the meantime. When the original tube was returned it was impossible to reinsert it owing to large cartilaginous granulations having formed inside the trachea, encroaching on the tracheal opening.

Treatment.—Cast the horse, applied cocaine over the granu-

lations, seized them with a sharp-pronged retractor, and removed them in slices with a sage knife, scraping away their bases with a curette. Still the tube (Jones's) could not be inserted, but on dilating the opening by means of a urethral dilator (used in urethrotomy in the horse), it was possible to insert it, tightly. Ordered the tube not to be taken out again. The horse hunted well during the season (1910-11) afterwards, and I have not heard anything about him recently.

A CASE OF CLEFT-PALATE IN A FOAL.

By JOHN JAMES RIDLEY, M.R.C.V.S.,

Beverley,

AND

FREDERICK HOBDAY, F.R.C.V.S.,

Kensington, W.

ALTHOUGH very commonly met with in the dog, the rarity of this condition in the horse tribe makes it worth while to put this case on record. The subject was a thoroughbred filly foal, worth, if normal, at least £500. The stud groom had observed shortly after birth that when the animal was sucking the mare the milk would return down the nostrils. She is now five months old, and the symptoms still persist, both fluid and semi-fluid food returning this way.

The patient is not in bad condition, as cod liver oil, Mellins' food, and various other nutriments have been given in addition to the best of food. An examination of the mouth revealed a cleft at the back of the mouth, about 1½ in. in length and mainly in the soft palate.

Treatment is at the present time impossible owing to the small space in which one can work to manipulate sutures, and it is doubtful, even if they could be inserted, whether they could be made to remain for a sufficient length of time to obtain permanent adhesion of the edges.

Canine Clinical Notes.

URETHRAL CALCULI IN A DOG.

By J. J. O'CONNOR, M.R.C.V.S.

Professor in the Royal Veterinary College of Ireland, Dublin.

Subject.—Aged collie in very poor condition. The dog had shown difficulty and pain in micturition for several weeks.

Symptoms.—Distressed appearance; passed urine in drops frequently; evinced pain on pressure over the prepubic region. Passed the catheter, which was arrested just behind the os penis.

Treatment.—Administered 1½ gr. morphia hypodermically. Exposed the penis from the sheath, opened the urethra just behind the os and extracted six small spherical calculi, corresponding in size to the diameter of the urethra. After their removal a flow of urine occurred from the bladder. The patient never rallied after the operation and died twenty-four hours afterwards. On *post-mortem* examination the bladder was found to be intensely inflamed.

NEEDLE AND THREAD IN THE RECTUM OF A PUG.

By J. J. O'CONNOR, M.R.C.V.S.

Professor in the Royal Veterinary College of Ireland, Dublin.

Subject.—A pug dog.

History.—A few days ago it was seen to swallow a needle and thread with which it was playing.

Symptoms.—Anxious expression, screaming occasionally from pain, passage of blood through the anus. On digital rectal examination a needle with thread attached could be felt about three-quarters of a finger's length in front of the anus, the point being directed backwards.

Treatment.—Brought the dog into the sunlight, dilated the anus and rectum with the equine urethral dilator, reflected the light into the rectum by means of a mirror, thus illuminating the foreign body, which was extracted by drawing on the thread to push the point through the mucous membrane, and then grasping the point with an artery forceps.

Abstract and Report.

OPENING OF THE ROYAL (DICK) VETERINARY COLLEGE.—INAUGURAL ADDRESS.

By Dr. CHARNOCK BRADLEY,

Principal.

Veterinary Science and its Relation to the Community.

The name and memory of William Dick, a native of this city, born in White Horse Close, will ever be held in reverence by the profession of which he formed so distinguished an ornament. To his penetrating foresight and indefatigable energy the genesis of this College is due. On his loyal and great-hearted generosity the continuance of the College after his death depended. Eighty-eight years ago Dick might have devoted his energies to the conduct of a private practice and the accumulation of wealth. Fortunately for veterinary science his was a more altruistic character. Instead of working for his own gain merely, he followed the advice of Dr. John Barclay, and, in a humble way, laid the foundation of the first veterinary school in Scotland. Of what the germ of his school was like we can form some idea from the words of one who wrote as an eye-witness. "You may fancy to yourself," says the writer, "a room of no very great dimensions in an old and apparently long untenanted house in Clyde Street. You enter it from the street door and are immediately struck with the delightful confusion which seems to reign within. Skeletons of all descriptions, from a horse to an ape, not ranged in regular order 'all of a row,' but standing higgledy-piggledy, their ranks having been broken by the Professor's table, and their heads looking in all directions, as if thrown together by chance. . . . Of that portion of the house which is set apart for the audience, the best thing I can say is that whenever I dropped in I have always found it remarkably well filled. It is fitted up with rough deal planks, set upon rough props, the seats rising tier above tier until your head touches the top of a dark-coloured ceiling."

From this modest beginning the College grew and grew rapidly. Extension after extension was made; elaboration after elaboration became necessary. In the beginning Dick was unassisted, but ultimately he was forced to gather around him a staff of teachers, some of whom later became famous in the veterinary and wider scientific world.

I think that without the slightest exaggeration or distortion of fact, we may say that as Dick's College grew, so came into being a veterinary profession in Scotland, and the growth of the two was inter-dependent. When the veterinary school was first projected a veterinary profession could scarcely be said to exist on this side of the border. We are told that at that time

there were not more than a dozen practitioners in Scotland, with the result that animal owners were almost entirely at the mercy of charlatans and quacks of the most ignorant description. With the dissemination of veterinary knowledge resulting from the establishment of the Clyde Street School, properly qualified practitioners became increasingly numerous and of vastly improved training. The rule-of-thumb man gradually—unquestionably very gradually—gave place to him who was equipped to take a more scientific and more common-sense view of the causes and treatment of animal diseases.

When William Dick died in 1866, "in the full tide of successful experiment," he had stamped upon veterinary science so indelible an impression, that the good work he had initiated continued and became ever more and more fruitful.

Veterinary science, not only in Scotland, but in the United Kingdom, and throughout the whole civilized world, has benefited by the movement which had its origin in the "old and apparently long untenanted house in Clyde Street." It was said during Dick's lifetime, and has been said since his death, that the Clyde Street School catered for the requirements of Scotland only. This is not, and never has been, according to fact. While Dick was still living 818 students graduated from this College, and of these barely more than half belonged to Scotland. A large proportion came from England and Wales, some from Ireland, and others from the Colonies and from foreign countries. Clearly the Edinburgh Veterinary College in those days was not parochial. What was true from 1823 to 1866 remains true to-day. Into the uttermost parts of the earth, beyond the confines of the seven seas, men have gone forth from the narrow and somewhat gloomy street where for all but ninety years the school has been located. Not long ago it was possible to say that the principals of all the veterinary colleges in the United Kingdom could claim the Clyde Street School as their Alma Mater, as can at the present moment the heads of the schools in London, Glasgow, Dublin, and Sydney. Not only in Scotland are graduates of this College practising their profession, but an examination of the Official Register of Veterinary Surgeons shows that practitioners trained within these walls are doing their work and maintaining the traditions of the school in every county of England, in every county but one in Wales, and in every county but three in Ireland. They are found in nearly all the King's Dominions beyond the seas. They may be met in many of the States of North America and in South America.

To give a list of famous men who have sat on the benches within this College would be tedious from its length. Let it suffice to say that former students have occupied and are occupying the most exalted positions in their profession. Almost as tedious would it be to recount the names of famous men who have been teachers in this school. Taking merely a few who have attained world-wide repute, and avoiding the perils attendant upon an assessment of their eminence, the roll contains the

names of Sir James Dewar, Fullerian Professor of Chemistry, Royal Institution; Sir John McFadyean, Principal of the Royal Veterinary College, London; James McCall, Principal of the Veterinary College, Glasgow; A. E. Mettam, Principal of the Royal Veterinary College of Ireland; Stewart Stockman, Head of the Veterinary Department of the Board of Agriculture and Fisheries; Daniel John Cunningham, the much-lamented late Professor of Anatomy in the University of Edinburgh; J. G. McKendrick, Emeritus Professor of Physiology in the University of Glasgow; Isaac Bayley Balfour, Professor of Botany, University of Edinburgh; James Arthur Thomson, Professor of Natural History in the University of Aberdeen. These, as well as other men of eminence, have helped to make the school what it is, and have influenced, and been influenced by, the traditions of the Institution.

Were we asked to state adequately but briefly what veterinary science has done since the time William Dick first entered Clyde Street as a teacher, we should find the task one of great difficulty, and of difficulty because of a richness of material. Beyond question veterinary science has performed a humanitarian function of surpassing moment in that it has rescued animals from the rough and ready, and even barbarous, treatment to which they, when ailing, were subjected during the earlier part —nay, even during a later part—of the nineteenth century. An examination of the tattered manuscript books which it was, and possibly still is, the custom to hand down from father to son among farmers, village smiths, and country quacks, produces a feeling of wonder that animals could survive the treatment to which they were subjected, and the weird and loathsome decoctions with which they were drenched. Unquestionably the growth and development of veterinary science has resulted in a more humane, and therefore more efficacious, mode of treatment.

Descending from the humanitarian to the utilitarian standpoint, it can be claimed without hesitation that veterinary science has been of inestimable benefit to the community. In how far the wealth of the country has been, and is being, conserved, cannot be definitely computed, but a very useful method of attaining an approximation is the examination of published statistical tables, showing the prevalence of contagious diseases, and the loss of animal life arising therefrom, during the past thirty or forty years.

The recent outbreaks of foot-and-mouth disease caused a certain amount of commotion amongst stock-keepers, and trade was in a degree affected. What must have been the result of the 18,732 outbreaks in 1883, when no fewer than 461,145 animals of various kinds were attacked! And what the dislocation of trade when in February of that year, all the country markets were closed for a month. Contrast the isolated and, nowadays, infrequent appearances of the disease in the United Kingdom with the returns as given for Continental countries. On June 15, in Germany alone, there were no fewer than 16,504 infected places. Holland had 4,602 outbreaks during the month of May. In Italy 25,004 animals were affected during the week

ending April 30, and in Russia there were 58,274 cases in the month of February. By contrast the returns made by our own Board of Agriculture pale into almost absolute insignificance. Nevertheless, it cannot be forgotten that a severe outbreak of foot-and-mouth disease would be a very serious thing. Recently Sir Edward Strachey (now Lord Strachie) has, in public utterance, pointed out that not only would there be great loss to the agriculturist, but the general public would suffer enormously because of the shortage of milk. This possibility makes it incumbent upon the State to encourage, if not institute, detailed investigation of the cause, and mode of transmission of, and possibility of complete protection from, the disease.

The Annual Reports of the Board of Agriculture afford abundant evidence of the saving of animal life from other contagious diseases, and the consequent prevention of monetary loss to the country.

Cattle plague, which on more occasions than one has produced the wholesale decimation of herds, has been unknown since 1877. In 1891 9,491 cattle were slaughtered on account of 192 outbreaks of pleuro-pneumonia. This disease has not been known in this country since 1898, whereas from 1891 to 1898 inclusive nearly 16,000 animals were destroyed.

Thanks to efficient steps having been taken, rabies—the very name brings terror—has ceased to exist in this country.

Sheep-scab, which formerly caused so much loss to sheep-owners, is steadily declining, so that last year there were only 556 outbreaks as compared with 1,939 eleven years ago, and 3,092 sixteen years ago.

Glanders, a disease to be feared by man because of its capacity of transmission from animals to the human subject, has also shown a steady decrease during recent years.

The only serious animal diseases which have not as yet been materially affected by preventive measures are anthrax and swine fever. These have offered problems difficult of solution, but there is no reason to despair of the ultimate reading of the riddle. Other diseases have prevailed for a time, but scientific investigation and the application of knowledge arising therefrom have ultimately resulted in their subjection. There is much to be hoped for in inoculation and serum-therapy.

While speaking of contagious diseases it is perhaps not entirely beside the point to make reference to certain facts relative to diseases among animals in more distant parts of the Empire. As will be readily admitted the presence of contagious animal disease is a potent factor against the spread of civilization and the development of the resources of our Colonies. Clearly man cannot establish himself permanently and satisfactorily in any part of the world without domestic animals. Man situated in those regions where animals survive with difficulty is, therefore, seriously handicapped. This is the case in certain parts of Africa. I have been informed recently that during thirteen months some 44,000 cattle have died in one single district from East Coast fever. Translate these figures

into pounds, shillings and pence, and we appreciate something of the troubles of the African stock-keeper. It is scarcely necessary to say that the authorities are quite alive to the fact that this state of things and the proper development of the country are not compatible. A properly organized staff of scientific workers is dealing with this and similar diseases, and on that staff graduates of the Dick Veterinary College are extensively represented. Report has it that there is great probability that a means of dealing with East Coast fever will soon be at hand. When this is accomplished the Dick Veterinary College will doubtless shine by reflected glory, for one of our graduates is at present pursuing a very promising line of investigation.

With the help of statistical tables which are readily available it is easy to show the decrease in contagious diseases. The prevalence or otherwise of non-specific disease is not so easy of demonstration. It is beyond doubt, however, that veterinary science, by disseminating knowledge regarding the maintenance of hygienic conditions is doing much to lessen the more common ailments of farm and other animals. Agricultural science has done a very great deal to reform the methods of the farmer. The tiller of the soil has now only himself to blame if he follows the haphazard and unsatisfactory procedures of his forefathers and reaps accordingly. But in the improvement of agriculture veterinary science can claim a share. The housing and feeding of animals has been studied not only from the purely scientific but also from the economic point of view. It has been demonstrated that there is a right and a wrong way of regarding the animal machine from the point of view of the economist.

In a further very important direction also science is helping agriculture. Breeding is being slowly raised from a process in which chance played the greater part to one in which there may be much certainty. The immortal if muddle-headed Mr. Tulliver was doubtless voicing the impression of most if not all his contemporaries when he said: "That's the worst on't wi' the crossing o' breeds; you can never justly calkilate what'll come on't." Without wishing to arrogate to science more than is her due, and while admitting that scarcely more than the fringe of the subject has been touched, it may be claimed that the very juvenile science of genetics has already justified its existence, and will, beyond doubt, be of inestimable assistance to the breeder of the future. There can be little doubt that, at no very distant time, it may be possible to "justly calkilate what'll come on't" when certain breeds and individuals are crossed.

The conviction that medical science, veterinary no less than human, must of necessity step aside from its purely curative function and give due regard to preventive measures, is of no new origin. For long it has been felt that preventive medicine had a great future before it, and it is becoming daily more evident that the conviction was well founded. Preventable disease is decreasing, and, with the more general adoption of hygienic measures, it is safe to prophesy, will continue to de-

crease. The study of the principles of immunity and their application also makes for prevention in no trifling degree.

When disease does effect a lodgment modern therapeutics—not forgetting serum therapy—constitutes a powerful weapon whereby the practitioner may stay its ravages. Without doubt the veterinary surgeon of to-day is more fortunate in his equipment than were his predecessors, and not least so in the possession of medicaments unknown to those who went before him, which have received such attention at the hands of investigators as has removed their use from the realm of empiricism.

In the immediate future, even more than in the present, it will be necessary for the veterinary profession to take a large share in the work of that organization which has been evolved for the preservation of the health of the people considered as a community. During recent years it has become more and more apparent that the veterinary officer has a function in public health administration scarcely less important than that of the medical officer. It is clear that the health of the community is constantly menaced by danger of a double origin. Not only may disease and death have a human source: there is an animal source as well. Some diseases such as glanders and anthrax may be conveyed from animals to man by accidental inoculation. Other specific diseases, such as tuberculosis, may be transmitted to the human subject by the consumption of unsound meat and milk. From his knowledge of all the phases of disease in animals, no one is better fitted than the veterinary surgeon to assist in the safeguarding of man from disease of animal origin.

In most large towns—shall we say in towns blessed with enlightened authorities?—there is a staff of efficient and specially trained veterinary officials. The value of their services cannot be put into figures, but in a town like Edinburgh we can say that it is through the instrumentality of highly competent veterinary inspectors that we eat sound meat and drink wholesome milk.

The day is not far distant when veterinary public health officers will form a very considerable proportion of the profession. That these men must continue and amplify the work they have been doing for some time past has been emphasized by the recently published final Report of the Royal Commission on Tuberculosis. In 1901 a Royal Commission was appointed in order that three questions regarding tuberculosis might be answered if possible. One of the questions was whether the disease in animals and man is one and the same. This has been answered in the affirmative, as has also the question whether animals and man can be reciprocally infected with it. Of the three questions the third is of supreme importance from a public health point of view, and was stated in these terms: Under what conditions, if at all, the transmission of tuberculosis from animals to man takes place, and what are the circumstances favourable or unfavourable to such transmission? The Report of the Commission, upon which sat one of the most eminent members of the veterinary profession, a graduate of the Dick College, may be allowed to

answer the question largely in its own words: "Only rarely has a pulmonary lesion in adult man yielded the bovine bacillus." But "our experience of abdominal tuberculosis in the human subject has been very different, especially as regards children. Of young children dying from primary abdominal tuberculosis, the fatal lesions could in nearly one-half of the cases be referred to the bovine bacillus, and to that type alone. In children, too, and often also in adolescents, suffering from cervical gland tuberculosis, a large proportion of the cases examined by us could be referred to the bovine tubercle bacillus." "Whatever, therefore, may be the animal source of tuberculosis in adolescents and in adult man, there can be no doubt that a considerable proportion of the tuberculosis affecting children is of bovine origin, more particularly that which affects primarily the abdominal organs and the cervical glands. And further, there can be no doubt that primary abdominal tuberculosis as well as tuberculosis of the cervical glands is commonly due to ingestion of tuberculous infective material." "The evidence which we have accumulated goes to demonstrate that a considerable amount of the tuberculosis of childhood is to be ascribed to infection with bacilli of the bovine type transmitted to children in meals consisting largely of the milk of the cow." "But it must be remembered that we have found cases of tuberculosis in adult man, sufficiently extensive to incapacitate the patient from the ordinary duties of life, and in two instances ending fatally, in which we were able to attribute the disease solely to the effect of the bovine tubercle bacillus."

The extent of these quotations is justified by the imperative necessity that the public and public authorities should be informed, on every possible occasion, of the momentous conclusions arrived at by a body of scientific men who have devoted their energies to the matter for the past ten years. With no uncertain voice have they made it clear that the services of the veterinary surgeon are needed, and urgently needed, in order that that much and naturally dreaded disease, tuberculosis, may be exterminated. For the sake of the children alone, if not also for the sake of adolescents and adults, tuberculosis in animals must cease to exist; and in the work of bringing about this eminently desirable state of affairs the veterinary officer of health, as well as the veterinary surgeon in general, must take a part. One more quotation from the Commission's Report: "In the interests, therefore, of infants and children, the members of the population whom we have proved to be especially endangered, and for the reasonable safeguarding of the public health generally, we would urge that existing regulations and supervision of milk production and meat preparation be not relaxed; that, on the contrary, Government should cause to be enforced throughout the Kingdom food regulations planned to afford better security against the infection of human beings through the medium of articles of diet derived from tuberculosis animals."

In view of the fact that fresh fields of activity are opening up for the veterinary surgeon both at home and abroad, no

effort must be spared to keep the veterinary schools abreast of modern requirements, or, rather, one should say that the schools must be ahead of present needs in order that there may be a suitable margin of preparedness for subsequent developments. The present is a momentous period in the history of veterinary science in general, and in Scotland in particular. The next few years, it is confidently expected, will see such changes as will render it certain that the Dick College will advance in its position as one of the leading veterinary schools of Europe. The governing authorities are alive to the fact that the modern veterinary graduate must have had a very different training from that received by his predecessors. Not only must he possess a first-hand knowledge of the more ordinary branches of his profession: he must be prepared to enter the ranks of those specialists who are so rapidly increasing in numbers. The graduate must not be content to have been spoon-fed by his teachers. He must have seen things for himself, *i.e.*, he must have done practical work in the laboratories and in the hospital, in the stable, the byre and the kennel. He must know something of veterinary public health administration. He must, in short, be ready with a substantial foundation upon which to erect a superstructure of knowledge for utilization in his work as a general practitioner, a member of the Army Veterinary Service, a public official either at home or abroad.

This means that the veterinary schools must expand their accommodation and equipment: must not relax to any degree their efforts to provide their students with a sound preliminary professional grounding; must be in a position to meet future calls upon their resources.

In addition it must not be forgotten that to the schools look the practitioner, the animal owner, the agriculturist, and the general public for those additions to knowledge which shall make for increased efficiency of the professional man, which shall produce diminution of animal diseases, and which shall ensure greater safety of the community from diseases and dangers of animal origin. Great though the recent advances of science may have been and many the secrets which have been probed, there is no fear that the scientist will imitate Dr. Busby and decline to remove his hat in the presence of the King for fear that the bystanders may not note what a great man he is. That which has been done merely serves to give some feeble indication of how much remains to be done, and engenders a feeling of humility rather than pride. There can be no resting on our oars. We must pull towards the light. The schools, therefore, in addition to being places where students are trained, must also be in a position to give habitation and encouragement to those who are prepared to devote their time and energies to the elucidation of problems, the solution of which can but be of benefit to their fellow men.

TRYPANOSOME DISEASES OF DOMESTIC ANIMALS IN UGANDA.*

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SYNONYMS.

Trypanosoma dimorphon (Dutton and Todd).
Trypanosoma congolense (Broden).
Trypanosoma confusum (Montgomery and Kinghorn).
Dr. Edington's trypanosome from Zanzibar (Bruce, Hamerton and Bateman).
Trypanosome from Chai-Chai, Zambesi, Zululand (Theiler).
Trypanosome from Southern Rhodesia (Bevan).

INTRODUCTION.

As might be expected from the tropical nature of the country, Uganda suffers much from protozoal diseases, and as the wealth of the natives consists principally in cattle, goats, and sheep—the king and chiefs having huge herds—there is much loss.

To give an idea of the enormous mortality which must take place among the herds of cattle in Uganda, Sir Apolo Kagwa, K.C.M.G., the Prime Minister, may be quoted. He informed the Commission that during 1908 he had 1,396 cows, which had 2,021 calves, and of these calves 709 died—35 per cent. Further, of cows, bulls, and full-grown bullocks, there had died 351. This makes a total of 1,060 deaths in one year. The number of the whole herd is not given, but may be put down at 4,000. This means a yearly death-roll of about 25 per cent. During the same year the Government Transport Department in Entebbe lost 156 oxen between June and November.

During 1909 the Commission had the opportunity of investigating several outbreaks of trypanosome disease among domestic animals, one among the transport cattle at Entebbe (lat. 0° 3′ N., long. 32° 30′ E.); another at Kampala (lat. 0° 18′ N., long. 32° 35′ E.); a third at the Uganda Company's estate at Namukekera (lat. 0° 40′ N., long. 32° 17′ E.); a fourth at Mr. Walsh's farm at Kabula Muliro, a few miles west of Namukekera; and a fifth at the Mabira Rubber Estate (lat. 1° 50′ N., long. 32° 40′ E.).

The commonest trypanosome disease among cattle in Uganda is caused by a trypanosome of the *dimorphon* type, which it is proposed to call *Trypanosoma pecorum*. This species is probably the same as that which has been known by the name

* Reprinted from the *Proceedings of the Royal Society*, B, vol. 82.

T. dimorphon (Dutton and Todd), and is either identical with, or very similar to, Broden's *T. congolense*. The name *dimorphon* is a misleading one, and can only be accounted for by Dutton and Todd describing under one name two species of trypanosomes occurring in the same animal. No one, so far as we are aware, has re-discovered Dutton and Todd's *T. dimorphon*, although many attempts to reconcile later observations with theirs have been made. Certainly the strain kept at the Liverpool School of Tropical Medicine under that name does not agree with the original description. The term *T. dimorphon* must therefore disappear, since it was born of a misapprehension. But it will at once be said, if the name *T. dimorphon* must go, why not call the species *T. congolense?* The only reasons that can be given are, that *T. congolense* is a local name, and, therefore, not very suitable; and secondly, that if it comes to strict priority, then *T. dimorphon* holds the field in spite of its misleading character and the error its authors fell into, because it cannot be denied that there is a strong feeling that *T. dimorphon* and *T. congolense* are one. At the same time, it must also be granted that there are others who are strongly of opinion that *T. dimorphon* and *T. congolense* are distinct species. Under these circumstances it seems best to unite the old names under a new one, and *T. pecorum* seems appropriate enough, as this trypanosome disease is peculiarly one of herds. Montgomery and Kinghorn have lately proposed the name *confusum*, in order to get out of the difficulty; but this name has been used for a trypanosome already, and it is, moreover, an awkward term.

It must then be understood that in the species *T. pecorum* we include *T. dimorphon*, *T. congolense*, the trypanosome discovered in Zanzibar by Edington and described in the *Proceedings*,* that from Portuguese East Africa and Zululand described by Theiler, and the species found in Northern Rhodesia by Montgomery and Kinghorn, and in Southern Rhodesia by Bevan.

The other species of trypanosomes found in the blood of cattle in Uganda were *T. gambiense*, *T. brucei*, *T. vivax*, *T. cazalboui*, and *T. nanum*. These names, however, may require to be reconsidered.

Distribution in Uganda.

Cattle suffering from *T. pecorum* were sent to the Sleeping Sickness Commission's laboratory at Mpumu from Entebbe, Kampala, Namukekera, Kabula Muliro, and Mabira. It is probably widely distributed throughout Uganda. It was also found in a horse which had arrived in Nairobi, British East Africa, from Abyssinia. The Commission is indebted to Mr. Stordy, Principal Veterinary Officer, for the opportunity of studying this trypanosome. It is not known where the horse became infected, but it must have been at some point between Nairobi and the Abyssinian border.

* B, vol. 81, p. 14.

MORPHOLOGY OF *Trypanosoma pecorum*.

(A) *Living, Unstained.*

This trypanosome, when observed in a preparation of fresh blood, is seen to remain at or near the same spot in the field—that is to say, it is non-translatory. It is, however, active and restless, the body quivering rapidly, and the undulating membrane and flagellum keeping up a constant vibratory motion. As a rule, it moves with the flagellar end in front. The contents of the cell are homogeneous, except for a vacuole at the posterior extremity.

A marked characteristic of this species is that it exhibits alternating periods of quiescence and activity. When quiescent it is usually invisible, as it has a habit of burying itself under small collections of red blood corpuscles.

(B) *Fixed and Stained.*

Method of Staining.—Giemsa's method, as described in a former paper,* was used.

Length.—The same method of measuring was used as described in the same paper.

Breadth.—Without the undulating membrane the average is about 2 microns; with the membrane, about 3 microns.

Shape.—This trypanosome, when stained, is short and stout in form. The posterior extremity is blunt, or rounded, or pointed

TABLE I.—*Trypanosoma pecorum.*

No. of experiment	Animal	Day of disease	Method of fixing and staining	In Microns		
				Average length	Maximum length	Minimum length
82	Ox	...	Osmic vapour and Giemsa	11.7	14.0	10.0
505	,,	42	,,	12.3	15.0	10.0
	,,	...	,,	13.2	15.0	11.0
593	Sheep	50	,,	14.5	17.0	10.0
44	Monkey	31	,,	12.2	14.0	10.0
559	,,	14	,,	12.7	16.0	11.0
461	Dog	44	,,	15.3	18.0	13.0
543	,,	10	,,	14.3	16.0	11.0
1,406	,,	31	,,	13.7	16.0	11.0
551	Rat	19	,,	12.6	18.0	8.0
626	,,	...	,,	12.8	15.0	10.0
398	Mouse	28	,,	14.6	16.0	13.0
398	,,	36	,,	13.1	17.0	10.0
			Average ...	13.3	16.0	10.6

* *Roy. Soc. Proc.*, B, vol. 81, p. 16.

and angular. The anterior end is narrower. The undulating membrane is fairly well developed, more so, perhaps, than in *T. nanum*. The flagellum arises near the micronucleus, and passes along the edge of the undulating membrane. There is no free flagellum.

Contents of Cell.—Generally homogeneous. Sometimes granules are seen which take on a chromatin stain, and are situated anterior to the nucleus.

Nucleus.—Is oval in shape, and situated about the middle of the body.

Micronucleus.—Small and round, and situated near to, but not at, the posterior extremity.

Undulating Membrane.—Is simple, but fairly well developed.

Flagellum.—There is no free flagellum. In very rare cases, where there is an appearance of a free flagellum, the trypanosome will be found to be dividing.

As will be seen from this tabulated statement, the disease set up in domestic animals by *T. pecorum* is a serious and fatal one.

Cattle, goats, sheep, monkeys, dogs, rats, and mice are susceptible. Guinea-pigs, on the other hand, are refractory. Horses, mules, donkeys, and rabbits were not available at Mpumu; so that, unfortunately, it is not possible to say whether they are inoculable or not. In regard to guinea-pigs, it would be interesting to know whether a series of inoculations into rats or rabbits would make the *T. pecorum* also pathogenic for them.

Theiler describes a trypanosome from Chai-Chai, near the mouth of the Limpopo, in Portuguese East Africa, from the mouth of the Zambesi, and also from Zululand, which resembles the one under discussion, in not infecting guinea-pigs, and considers that this one fact is sufficient for the creation of a new species. We cannot agree with him in this, as there is no practical importance, except in the laboratory, in the fact that the guinea-pig is insusceptible, and, moreover, until more experiments have been made, we cannot be sure that under certain conditions of dosage or passage through the smaller animals the guinea-pig will remain refractory.

The important facts in regard to this species are, that man is not susceptible, but that the valuable domestic animals are, and that in these animals the disease is, as a rule, a fatal one.

As long as our knowledge of trypanosomes is limited, it seems better to group them under as few names as possible. As knowledge grows, and as fundamental differences emerge, then it will be time to define them more strictly. As far as our present knowledge goes, the morphology of *T. dimorphon*, *T. congolense*, the Uganda, Zanzibar, Chai-Chai, Zambesi, Zululand, and Rhodesian strains is identical; these trypanosomes affect the same important domestic animals; the carrier is probably or may be the same, though this is not known, and therefore these various forms should, for the present, be grouped under one name, and for certain reasons given above we propose the name *T. pecorum* for this group.

TABLE II.—ANIMALS SUSCEPTIBLE TO *Trypanosoma pecorum*.

No. of experiment	Source of virus	Period of incubation, in days	Duration of disease, in days*	Remarks
		Cattle.		
82	Natural infection	?	2	Died 2 days after arrival
110	,, ,,	?	243	Treated with lithium antimonyl tartrate.
230	,, ,,	?	4	Died 4 days after arrival.
357	,, ,,	?	3	,, 3 ,, ,,
358	,, ,,	?	1	,, 1 day after arrival.
359	,, ,,	?	60	Treated with arsacetin.
360	,, ,,	?	14	Died of *Trypanosoma pecorum*.
391	,, ,,	?	313	,, ,,
475	,, ,,	?	9	Died 9 days after arrival.
476	,, ,,	?	2	,, 2 ,, ,,
477	,, ,,	?	13	,, 13 ,, ,,
482	,, ,,	?	5	,, 5 ,, ,,
483	,, ,,	?	34	,, 34 ,, ,,
505	,, ,,	?	265	Killed.
550	,, ,,	?	—	Treated with arsenic; still alive after 254 days.
1459	,, ,,	?	43	Died 43 days after arrival.
1560	,, ,,	?	46	,, 46 ,, ,,
1731	,, ,,	?	79	Killed.
1733	,, ,,	?	76	Died 76 days after arrival.
1735	,, ,,	?	79	Killed.
1736	,, ,,	?	79	,,
1737	,, ,,	?	84	Died of *T. pecorum*.
97	Ox	9	46	,, ,,
447	,, ...	8	287	Killed.
1463	,, ...	7	35	Died of *T. pecorum*.
1464	,, ...	7	14	,, ,,
1225	Monkey ...	—	—	Died 8 days after inoculation; bitten by snake. Never showed trypanosomes.
1357	Dog	6	15	Died of *T. pecorum*.
1358	,, ...	6	18	,, ,,
1359	,, ...	6	22	,, ,,
1363	,, ...	6	15	,, ,,
1364	,, ...	6	38	,, ,,
1365	,, ...	6	29	,, ,,
	Average ...	6.7	63	
		Goat.		
1005	Ox	—	—	Never showed trypanosomes; still alive after 72 days.
1006	,, ...	14	44	Cause of death doubtful.
1404	,, ...	9	41	,, ,, ,,
1405	,, ...	—	—	Never showed trypanosomes; under observation 31 days.
633	Monkey ...	12	51	Cause of death doubtful.
	Average ...	11.6	45	

* Duration includes the days of incubation; it dates from the day of infection.

TABLE II.—ANIMALS SUSCEPTIBLE TO *Trypanosoma pecorum*.—*Continued.*

No. of experiment	Source of virus	Period of incubation, in days	Duration of disease, in days*	Remarks
				Sheep.
697	Ox	21	—	Still alive after 170 days.
632	Monkey ...	8	43	Cause of death doubtful.
593	Dog	19	168	Died of *Trypanosoma pecorum*.
	Average ...	16	105	
				Monkey.
44	Ox	14	35	Died of *T. pecorum*.
49	,, ...	10	16	,, ,,
376	,, ...	11	56	,, ,,
683	,, ...	10	61	,, ,,
1740	,, ...	11	—	Still alive after 45 days.
719	Sheep	21	—	,, ,, 216 ,,
350	Monkey ...	10	181	Died of *T. pecorum*.
459	,, ..	6	80	,, ,,
1000	,, ...	16	45	,, ,,
460	Dog	11	75	Killed for cultivation experiments.
559	,, ...	12	39	Died of *T. pecorum*.
560	,, ...	14	32	,, ,,
581	Rat	13	86	,, ,,
	Average ...	12.3	64	
				Dog.
543	Horse	9	26	Died of *T. pecorum*.
148	Ox	10	46	,, ,,
349	,, ...	22	91	,, ,,
552	,, ...	—	—	Re-injected after 17 days.
1007	,, ...	—	—	Found dead after 14 days.
1406	,, ...	21	29	Killed.
1407	,, ...	—	—	Died; under observation 31 days.
1193	Monkey ...	8	16	Died of *T. pecorum*.
433	Dog	7	44	,, ,,
434	,, ...	9	58	,, ,,
461	,, ...	6	40	,, ,,
1544	,, ...	10	21	,, ,,
552	Rat	—	—	Still alive after 49 days.
	Average ...	11.3	42	
				Guinea-pig.
685	Ox	—	—	Still alive after 96 days.
1162	,, ...	—	—	,, ,, 36 ,,
1163	,, ...	—	—	,, ,, 36 ,,
1164	,, ...	—	—	,, ,, 36 ,,
1647	,, ...	—	—	Died; under observation 29 days.
628	Monkey ...	—	—	Still alive after 104 days.
1002	,, ...	—	—	,, ,, 50 ,,
566	Dog	—	—	,, ,, 78 ,,

* Duration includes the days of incubation; it dates from the day of infection.

TABLE II.—ANIMALS SUSCEPTIBLE TO *Trypanosoma pecorum*.—*Continued.*

No. of experiment	Source of virus	Period of incubation, in days	Duration of disease, in days*	Remarks
				White rat.
397	Ox	17	39	Died of *T. pecorum*.
551	,, ...	16	18	Killed for cultivation experiments.
684	,, ...	16	32	Died of *T. pecorum*.
699	,, ...	—	—	Experiment stopped after 57 days.
1646	,, ...	12	16	Died of *T. pecorum*.
626	Monkey ...	12	22	Killed for cultivation experiments.
1001	,, ...	13	23	Died of *T. pecorum*.
455	Rat	9	12	,, ,,
729	,, ...	11	21	,, ,,
1708	,, ...	8	12	,, ,,
	Average ...	12.6	21	
				Mouse.
686	Ox	—	—	Experiment stopped after 59 days.
398	Monkey ...	26	41	Died of *T. pecorum*.
627	,, ...	12	26	,, ,,
454	Mouse	6	12	,, ,,
	Average ...	14.7	26	

* Duration includes the days of incubation; it dates from the day of infection.

Disease set up in Cattle by Trypanosoma pecorum.

It is unnecessary in this paper to describe in detail the symptoms which can be noted during life, or the pathological changes set up in the organs of cattle by this trypanosome. It will be sufficient to say that the main symptoms are emaciation, anæmia, and progressive weakness, and that the principal *post-mortem* appearances are those due to anæmia.

Incubation.—As is probably true of most trypanosome diseases in susceptible animals, the period of time which elapses between the infection of the animal and the appearance of the trypanosomes in sufficient numbers in the peripheral blood to be seen by the microscope is a short one, in this case an average of 6.7 days.

Duration.—Of the course and duration of this disease in cattle little, unfortunately, is known. Most of the cattle which came under observation at the laboratory of the Commission at Mpumu were already sick when they arrived, and it was, as a rule, impossible to know when they had been infected. By referring to the table, it will be seen that twenty-two naturally-infected cattle were under observation. Four of them lived, on an average, nine months. Of these four, one, treated with arsenic, was still alive and apparently healthy in December, 1909, one was killed, one had been treated with lithium antimonyl tartrate, and one died without treatment at the end of 313 days. It is therefore

impossible to say from the insufficient data at our disposal whether spontaneous cure ever takes place in this disease in cattle.

When we turn to the cases of cattle which were inoculated on the hill, and were therefore under observation from the beginning, we are struck by the rapid course of the disease. One animal certainly lived 287 days, but the remainder died, on an average, in twenty-six days from the date of infection. Most of these oxen were inoculated with a strain of this trypanosome, which had caused a rapidly fatal epidemic among a herd of milch cattle belonging to Mr. Walsh, at Kabula Muliro. In the short space of one month twenty-four of Mr. Walsh's cattle died, and in two months thirty-four had died out of a herd of about 300 head.

It may therefore be concluded that *T. pecorum* sets up a rapid and fatal disease in cattle.

Disease set up in Goats and Sheep by Trypanosoma pecorum.

The number of cases of this disease in goats and sheep which came under observation is too small to draw any conclusions from. At Mpumu the goats and sheep were not satisfactory experimental animals, as many of them died from some unknown cause. It was thought that as these animals usually lived in the valleys, and were often housed in their owner's hut during the night, the exposure on the top of the hill had a bad influence. One sheep was still alive after 168 days, and it is probable that most of the goats and sheep would have lived much longer if they had been kept under more favourable conditions.

Disease set up in the Smaller Laboratory Animals.

It is not necessary to describe in detail the action of *T. pecorum* on the monkey, dog, and smaller laboratory animals, as a reference to the table will show the average periods of incubation and duration. It will be seen that this is a fairly rapid and fatal disease in the dog, white rat, and mouse. In the monkey the average duration is about two and a-half months.

THE CARRIER OF *Trypanosoma pecorum.*

Glossinæ.—From experiments made in the laboratory at Mpumu, it seems probable that *Glossina palpalis* is capable of acting as a carrier of this trypanosome. Four experiments were made with ordinary wild Lake-shore flies, and of these one was successful. Four were also made with laboratory-bred flies, and one again came off. The latter experiment, however, with laboratory-bred flies, was not free from doubt; but from the other, which seemed free from doubt, it appears that *T. pecorum* can develop in *G. palpalis*, and infect a healthy animal after a period of twenty-one days. More observations are required. It may be noted that in no instance did *T. pecorum* appear in the blood of animals upon which freshly-caught Lake-shore tsetse flies had been fed. These flies were found to be naturally infected with *T. gambiense* and *T. vivax*. This is an argument,

though a small one, that *G. palpalis* is not the common or chief carrier of *T. pecorum*.

Tabanidæ.—There is some circumstantial evidence available to show that *T. pecorum* is carried by the *Tabanidæ*. In the valleys round Mpumu Hill, so far as we are aware, there are no tsetse flies at any time of the year. As a rule, there are a few *Tabanidæ*. The cattle belonging to the Commission went down to the foot of the hill every morning to graze, and returned to their kraal on the top at sunset. Half of the herd went to the east of the hill and half to the west. On both sides there was a small valley or glen, through which ran a small stream. In these valleys during the year, as a rule, a *Tabanus* or two or a *Hæmatopota* could be seen, but they were in small numbers. Now, it is a curious fact that at certain times of the year enormous numbers of *Tabanidæ* will suddenly appear in places where only a few are, as a rule, to be found. For example, Mr. Brown, at Mabira, who was collecting the biting flies of his district, wrote on March 14, 1909, that the *Tabanidæ*, which for months had been scarce, were then swarming everywhere in countless numbers, and he afterwards wrote that this invasion lasted about a month. The particular species which appeared at Mabira at this time was *Tabanus socialis* (Walk.).

So, in the same way, at Mpumu, the *Tabanidæ*, which had been rare, suddenly appeared in swarms. They were first seen in the valley to the west of the hill in September, 1909, and a month later in the valley to the east. Soon after this the cattle which had shown no signs of disease during the previous year were found to be suffering from *T. pecorum*. Those which grazed in the valley to the west were the first to be affected, and afterwards those which grazed to the east of the hill. The species of *Tabanidæ* in this case was *Tabanus secedens* (Walk.). In both groups of cattle there were cases of *T. pecorum* disease, so that the *Tabanidæ* had a reservoir from which to draw the virus.

Another sudden epidemic of *T. pecorum* disease occurred on Mr. Walsh's farm at Kabula Muliro, where, as stated above, thirty-four milch cattle died within two months in a herd of 300. The evidence is all against this epidemic having been caused by tsetse flies. During February and March, and again later in the year during August and September, as many as 100 fly-boys were engaged scouring this district for biting flies. *Tabanidæ*, *Hæmatopota*, and *Chrysops* were brought in, but not a single tsetse, although a reward of 5 rupees was offered for each specimen. The commonest *Tabanus* in this district during August was *varietus* (Walk.).

It may, therefore, in our opinon, be concluded that the trypanosome disease caused by *T. pecorum* can be carried from sick to healthy animals without the aid of *Glossinæ*, but what other species of fly, if any, acts as carrier is merely a matter of speculation at present.

Stomoxys.—Montgomery and Kinghorn state that they have strong evidence against this genus. At Mpumu several experi-

ments were made to attempt to settle this question, but although they were persevered in for months, they remained negative. *Stomoxys* are so numerous in every part of the country all the year round that it seems inconceivable that they can act as carriers. From October, 1908, until the following September, although numerous cases of cattle with *T. pecorum* in their blood grazed all day long with healthy cattle, yet not a single case of infection took place. The *Stomoxys* were exceedingly numerous all this time, forming a small cloud of flies round the cattle, and passing constantly from one animal to another, being driven hither and thither by the rapidly-swishing tails. This is a natural experiment on a large scale.

It will therefore require very convincing proof to bring this Commission to the belief that *Stomoxys* are carriers of this disease.

The subject of the carrier *T. pecorum* must remain in this unsatisfactory state for the present, but it is hoped that experiments which are at present being carried out at Mpumu may throw some light on this important part of the subject.

CULTIVATION OF *Trypanosoma pecorum*.

One difficulty experienced at Mpumu in attempts to cultivate the various trypanosomes was that rabbits were not available to supply the blood for Novy and MacNeal's medium. The blood of rats, goats, and oxen was used; but in making the cultivation of trypanosomes a factor in their diagnosis uniformity must be of the first importance.

Another difficulty was the frequency of contamination of the tubes. This was, perhaps, to be expected in a laboratory on the top of a hill in the Tropics, with very free ventilation.

T. pecorum grows fairly readily on blood-agar medium. At the end of twenty-four hours clumps may be seen containing many trypanosomes, with their flagellar ends directed outwards and in active motion. The individual flagellates have irregularly-shaped granules of chromatin scattered through their body substance, and also many brightly refractile vacuoles. After forty-eight hours' culture every field contains many active trypanosomes, and also small clumps composed of ten, twenty, or more members.

After six days the trypanosomes are still very active; they vary much in size and shape, from the plasmodial to the elongated, flagellated, highly active trypanosome. After this they seem to degenerate, and in a few days living trypanosomes can no longer be found in the tube.

This description approaches to some extent that of the cultural characters of Dr. Edington's trypanosome from Zanzibar and *T. dimorphon*, but there is not that extraordinary growth which was described as covering several fields of the microscope. Whether this was due to the difference in the composition of the blood medium, or to the higher temperature at Mpumu, it is impossible at present to say.

CONCLUSIONS.

(1) *T. pecorum* is an important trypanosome disease of domestic animals in Uganda.

(2) It is similar in morphology, action on animals, and cultural characters to the *T. dimorphon* described by Laveran and Mesnil, and to Dr. Edington's trypanosome from Zanzibar, described in the *Proceedings*,* except that T. pecorum is not pathogenic to guinea-pigs.

(3) The carrier is unknown, but is probably a *Tabanus*, and not *Stomoxys*.

Miscellaneous.

LITERARY NOTE.

MESSRS. BAILLIERE, TINDALL AND COX announce that they have been authorized by the Department of Education of the Sudan Government to publish immediately the Fourth Report of the Wellcome Tropical Research Laboratories, Khartoum. The Third Report was issued in 1908, since when a great amount of important research work has been accomplished, and the announcement that a further instalment is to be expected should arouse the keenest interest among students of Tropical Medicine.

The thorough examination of the conditions of tropical life, as they present themselves in men, animals, plants, and insects, is the task to which this great Institution is devoted, and the Fourth Report, which is in three volumes, contains facts, observations and discoveries recently brought to light. It is the actual record at first hand of new contributions to the solution of problems of deep and world-wide importance.

The edition is, however, limited, and in order to ensure delivery of copies immediately upon publication, it is essential that orders should without delay be forwarded to the publishers.

ROYAL COLLEGE OF VETERINARY SURGEONS.

FELLOWSHIP DEGREE.

A MEETING of the Board of Examiners for this Degree was held at the College, 10, Red Lion Square, W.C., on Saturday, December 2. The following is a list of the successful candidates, together with the title of their respective theses:—

R. L. Phillips, "The Clinical Aspect of Infectious Pneumonia of the Horse."

A. F. Castle, "Sterility in the Mare."

F. J. Dunning, "East Coast Fever, particularly as applied to South Africa (Rhodesian, Red-water, or African Coast Fever)."

* B, vol. 81, p. 14.

ADDRESSES WANTED.

THE present addresses of the under-mentioned Members of the Royal College of Veterinary Surgeons are unknown. The Statutory Notices have been sent out by the Registrar, and unless an address is received during the year 1911 the names will not be included in the Register for 1912.

Name.	*Last address known.*
Bayes, James ...	... Late of Agricultural Department, Cape Town, South Africa.
Bird, Robert H. ...	... Fort Collins, Colorado.
Brassington, A. ...	... 15, Mornington Road, New Cross Road, S.E.
Casewell, W. Thos. ...	.. Newport, Salop.
Cobbledick, J. O. ...	... Queen's Row, Clifton, Bristol.
Davies, Arthur W. ...	... Lennox Taylor Co., Iowa, U.S.A.
Deakin, Herbert Walmesley	109, Welbeck Street, Ashton-under-Lyne, Lancs.
Dowell, Frank W. ...	... 128, Jermyn Street, St. James's, S.W.
Farrell, Capt. G. H.	... Hyderabad (Deccan), India.
Fetherstonhaugh, H. H.	... King's Somborne, Stockbridge, Hants.
Hall, James W. ...	... 40, High Street, Hawick.
Jackson, A. F. S. ...	... Johannesburg Turf Club, Johannesburg, South Africa.
Kennedy, W. R. ...	... 216, Selhurst Road, South Norwood, S.E.
Muirhead, John T. ...	... 14, Merchiston Gardens, Edinburgh.
Scott, William ...	... Royal Artillery, Victoria Barracks, Sydney, N.S.W.
Simpkin, F. A. ...	... Grosvenor House, Horncliffe Road, Blackpool.
Smith, Steven Marsh	... Late Capt. A.V.C.

Review.

THE ANNUAL REPORT OF THE VETERINARY OFFICER FOR THE NEWCASTLE CORPORATION.

FIVE years ago Newcastle-on-Tyne found itself in such a deplorable condition regarding its slaughterhouses that, through shame alone, it was bound to move in the direction of some reform or other. Unfortunately, there appeared to be no one

in evidence who either would or could advise the authorities as to what they really required. Eventually it was decided to spend some thousands of pounds on the reconstruction of a few obsolete slaughterhouses at the west end of their cattle market. In exchange for their money Newcastle inhabitants got about eighteen new slaughterhouses erected on the same site. These consist of seventeen small private slaughterhouses and one a little larger than the remainder, which the authorities designate a public slaughter hall. This it is named simply because the corporation itself holds the licence, and charges so much per head for animals slaughtered there. But it only provided accommodation for about a dozen cattle and about fifty sheep, the word "public" being a misnomer.

The following year a veterinary officer was appointed to the city for the purpose—besides acting as veterinary inspector—of supervising the whole of the meat and food inspection and slaughterhouses. According to his annual reports, we find that there then remained some 132 slaughterhouses. But although these premises included the eighteen new ones, he was not satisfied that any of them were desirable.

Faced with the supervision of a large number of obsolete insanitary and unfit premises, it would appear that some uphill work was in store. During the next year or two the very worst were brought prominently before the Sanitary Committee, with the result that no less than twenty-one of these premises were wiped off the map. Shortly afterwards another one was closed, leaving a grand total of 110 separate slaughterhouses. These consisted of five groups, varying from six to eighteen each, and fourteen separate premises.

One group of	40
,, ,, ...	18
,, ,, ...	18
,, ,, ...	7
,, ,, ...	6
,, ,, ...	7
Separate premises	14
	110

The next step was to deal with the worst of those remaining. These consisted of the largest group in the centre of the city, forty in number. These premises (according to the veterinary officer's reports) were surveyed by the Sanitary Committee, who decided not to relicense them in the future. As time went on it was found that a large number of butchers would have no place in which to slaughter their stock, and, recognizing this difficulty, the Sanitary Committee therefore—rather than treat the butchers too harshly—decided to grant temporary licences for short periods. Had the committee been pushed too quickly, probably the result would have been that more new but obsolete slaughterhouses would have been erected at the cattle market

to make room for the butchers cleared out of the forty bad premises. The Sanitary Committee, it is believed, are almost unanimous now as to the requirements of a public abattoir for the City of Newcastle-on-Tyne. Moreover, the butchers of the city are almost equally of the same opinion. The licences of the forty bad slaughterhouses just referred to—it is believed—terminate next March, and then it is highly probable that the whole question of public abattoirs will be tackled. Perhaps it is well for Newcastle that during the past three or four years this subject—a difficult one—has been handled steadily, so that, instead of more obsolete slaughterhouses, the butchers and the corporation have become more agreed as to the requirements of an abattoir.

Newcastle is a large city, extending several miles, where slaughterhouses are scattered widely over the district, proper inspection consequently—as pointed out—being an absolute impossibility. A strong example of the fact that separate premises—run privately—in different parts of the city make it impossible to supervise as is considered desirable, not only from the point of view of transmissible disease, but also from the point of view regarding cleanliness, is given in the veterinary officer's annual report of last year, *e.g.*, maggoty fat.

Newcastle is a wealthy landowner, for at the east end she possesses acres of land which adapt themselves admirably for the erection of not only abattoirs, but also cattle markets, and everything else appertaining to the business concerning meat, &c. This land has the railway running past it, is splendidly situated for a siding; in fact, for everything required. Even assuming that they decided not to remove the present market, there is a large site adjoining, known as the Old Infirmary site, between the cattle market and the railway—in fact, there being only a street's width separating the two—where the corporation could find room on which to erect an abattoir. This land also is the property of the corporation. Will the Newcastle Corporation muddle things again, or will they—whilst the opportunity is open to them—use their land for the erection of an institution more urgently needed at the present than any other—now? Surely the ratepayers will not allow such an opportunity to escape and thus be—in the future—put to the expense of a more costly site for an institution that will have to come sooner or later.

J. B.

Translations.

SHYING IN HORSES.

By RAYMOND NESENI,

Veterinary Surgeon in the 8th Regiment of the Austrian Dragoons.

ACCORDING to Chief Lieutenant v. Máday, (1) shying in the horse is "merely a habit which has been contracted through faulty and lazy breaking-in or training." Kirnbauer (2) considers

that shying is due partly to irrational training and handling and partly to faulty eyes. Of the defects in the eye, sclerosis of the lens is the chief, which, according to Kirnbauer, is met with in 95—98 per cent. of shying horses. Bayer (3) in connection with the causes of shying writes: "If not due to turbidity and other pathological changes brought about by inflammation, it is generally caused by a refraction anomaly due either to a high degree of myopia or severe astigmatism."

Since Kirnbauer's remarks interested me I examined the shiers present in the regiment, 37 in number, with the following result: Normal eyes 13.5 per cent., sclerosis of the lens 62.1 per cent., myopia 10.8 per cent., other ocular defects 13.6 per cent. Of other defects I found: Turbidity of the conjunctiva, enlarged or low hanging corpora nigra, pigment spots on the anterior capsule of the lens (very frequent), as well as slight opacities of the lens.

Kirnbauer asks: "Can shying be foretold in presence of certain visible changes in the eye?" and this is his answer: "The horse with sclerosis shies as a rule, so that the probability of a disposition to shying in the presence of this defect is great." According to my observations this is not the case. Sclerosis of the lens, which according to Bayer is very frequent in horses, could be established by me in 65 per cent. of a further 470 horses examined. If one now takes into consideration that the examined shying horses only represented 7.7 per cent. of the whole regiment, and in these only a little over a half (about 4½ per cent.) showed sclerosis, it seems that the probability of disposition is not so great as Kirnbauer would have us believe. Further trials, however, need making before one can express an exact judgment on the matter.

LITERATURE.

(1) v. MADAY: "Vicious and Good-tempered Horses," *Kavallerist Monat.*
(2) KIRNBAUER: *Oest. Woch. für Tierheilkunde*, 1911, No. 15.
(3) BAYER: *Augenheilkunde*, 1900, p. 476.

(*Oesterreichische Woch. für Tierheilkunde.*)

A CASE OF INFLAMMATION OF THE BRAIN AS A RESULT OF DISEASE OF THE LEFT OLFACTORY BULB THROUGH BOTRIOMYCOSIS.

BY STAFF VETERINARY-SURGEON WERRMANN.

THE service horse Rachel, of the 2nd Company of the 1st Training Battalion No. 12, fell ill on June 10, 1911, showing symptoms of inflammation of the brain.

The clinical position was as follows: Rachel had shown symptoms of restlessness on the afternoon of June 9, but these disappeared in the course of an hour. According to the attendant, the horse climbed up into the crib, soon got down again, pressed her head against the wall, remained in this

position some time, and then the attack passed away. Only part of the evening food was eaten up, whilst the morning feed on June 10 remained untouched. An examination undertaken now showed the following: Rachel held her head sunk under the manger, and only took up another position slowly when asked to do so. The pupil is contracted, the conjunctival and nasal mucous membrane are slightly injected, the pulse is frequent, there is no rise of temperature. On bringing out of the stall the animal rushed violently forwards with a fixed gaze, and could only be brought by two men into the sick box with difficulty. Then circular movements to the right began immediately. After an hour, these movements ceased and Rachel remained standing with sunken head in the corner of the box, and only with great effort could she move to take up another position. Treatment undertaken immediately consisted in injection of pilocarpine and arecalin and ice to the poll.

In the afternoon circular movements to the right commenced again, but for the rest the position remained the same. Taking of food was at a standstill. On the next day there was slight improvement. Circular movements were rare and only continued for a short time, but symptoms of depression occurred regularly and lasted longer; the animal laid down and remained prone with outstretched head and neck for an hour at a time. When called, she sprang up in a fright and again commenced the movements.

On June 12 the condition was much better. Food was taken, and if not normally yet in sufficient quantities, and this condition continued until June 17, when symptoms of intense disturbance set in. The head and neck, after these fury attacks, were greatly elevated, and the animal sought to hold on to the wall, whilst at the same time loud grinding of the teeth could be heard. Alternating with this, the circular movements occurred, after which Rachel threw herself down violently and spasms of the muscles of sight ensued. The disease gradually got worse, until on June 22, at half-past five at night, death occurred.

On opening nothing abnormal was found in the thoracic cavity, but in the abdominal cavity there was a healed up peritonitis with numerous growths and fibrous adhesions occupying a small area, but all the organs were healthy. Section of the cranial cavity showed the dura mater hyperæmic and riddled with hæmorrhages and its internal surface covered with small fibrinous rings. The vessels of the pia are very hyperæmic. On the left side of the base of the skull the pia is firmly united to the dura to the extent of a mark piece in area. The brain substance is œdematous superficially. The ventricles of the brain are filled with moderate amounts of a clear yellow serous fluid. The olfactory bulb is knotty and roughened irregularly throughout its whole extent. The whole appearance gave one the impression of a tumour. The colour is greyish white, the consistence moderately hard. The cut surface is greyish white in colour, but nothing of the normal brain substance remains. In this changed tissue are smaller and larger yellowish masses of brittle

granular consistence. In the growth between the pia and the dura there was a yellowish nodule the size of a pin's head.

The whole *post-mortem* appearances resembled those of tuberculosis. The disease was declared to be botriomycosis by Dr. Joest. This is the second case of the kind that has been noticed. The first was recorded by Dr. Joest in his annual report of proceedings at the Dresden College.

Joest considers that infection took place through the nasal cavities.

(*Zeitschrift für Veterinärkunde.*)

THE ASCARIDES OF THE HORSE AND THEIR PREVENTION WITH ANTIMONY TARTRATE.

By GRIMME.

TARTAR emetic has already caused numerous controversies in the German Press. One set of these affirm the non-toxicity of large doses (20 grm.); the other warns against the danger of less than half these doses, with the result that a doubt existed which profited a parasite that could not be tackled with certainty.

The author has treated about 12,000 to 15,000 horses, and utilized in good and bad years 1 kilogramme of tartrated antimony. He has noticed that the ascarides are much more frequent in young subjects, and most of all in those under a year old. In two cases he has observed them in foals eight weeks old that had never left the stable, and had therefore never been infected at pasture.

The diagnosis of the presence of ascarides is very difficult when one is not assisted by their expulsion in the fæces. The violence of borborygmus, frequent yawnings, localized sweating at the flanks, cause one to make investigations into the cause of the unexplainable emaciation. As for treatment the author is an enthusiastic partisan of antimony tartrate; if result has to be long waited for, he does not hesitate to administer a fresh dose of the drug. In subjects of 2 to 4 years he gives a dose of 15 to 20 grm.; foals of one year receive 10 grm. (about 2½ dr.), and those of six months 5 grm. The division of these doses into three parts during the day only offers some disadvantages. This is how it is used: The subject to be treated is given no water the evening before dosing; the tartrated antimony is dissolved in a pail of water; one uses a third of it at six o'clock in the morning, a third at seven o'clock a.m., and a third at eight o'clock in the morning. The ration is only given at half-past eight. Purgatives are useless if the feed comprises green-stuff or carrots.

Fatal cases published up to the present are, according to the author, due to a defective method of administration or to some other cause.

(*Deutsche Tierärztliche Woch.*)

AN INTERESTING BRANCHIOGENOUS TOOTH HETEROTOPY (A TOOTH IN THE BRAIN) IN A HORSE.

BY JOEST.

VETERINARY COUNCILLOR WILHELM, of Zittau, sent the head of an eleven-year-old horse to the Institute which had died of "subacute inflammation of the brain." The history was that the horse showed first time symptoms of a subacute inflammation of the brain five months before death and had previously been healthy. The symptoms lasted fourteen days and then declined. About eight days later the animal again fell ill and did not recover. Both attacks commenced with slight fever, the horse made circular movements to the right and inclined its uplifted head to the right, there were disturbances of consciousness and sensation.

Pathological-anatomical examination showed no visible external changes in the skull. It was opened in the usual way, but the brain could not be taken out intact as one part of its base was firmly adherent to the dura.

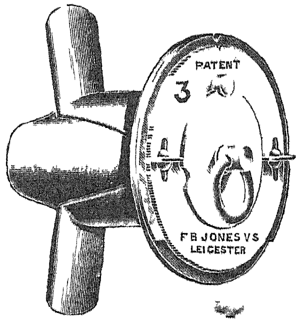
The brain itself showed at its base, in the neighbourhood of the right trigonum olfactorium, a bony hard protuberance, adherent to the dura but not to the bones of the skull, which appeared four-cornered and quite blunt, and about the size of the crown of a molar tooth of the horse. This prominence was yellow in colour, cut obliquely inferiorly, directed to the right, and was covered with a thin layer of connective tissue. Two root-like continuations of the crown of the tooth were partly visible when taking the brain out of the skull, and after dissection they could be plainly seen lying on the ventral surface of the brain. In this condition the whole brain was hardened in formalin.

The teeth of the horse could not be examined as only the skull had been sent. The anomaly was plainly a tooth, and its two roots and four-cornered crown correspond to those of a molar. It was doubtless a congenital tooth heterotopy. Such a condition can only arise from embryonal branchiæ diversion and is consequently of branchiogenous origin. Joest considers that teeth in the brain should not be classed as teratomes, but as simple malformations, for which the best name is branchiogenous tooth heterotopy.

(*From the Report of the Royal Veterinary College in Dresden,* 1910.)

JONES' TRACHEOTOMY TUBE.

MANY tracheotomy tubes have been devised from time to time, but we consider that none has eclipsed that invented by the late F B Jones, M R C.V S , of Leicester, as illustrated below This tube has the great advantage of evenly distributing pressure all round



the operation wound, and so reducing the probability of the formation of excessive granulations The tubes are very simple, and very easily inserted and removed, and are very durable They are made in four sizes, and may be obtained from the inventor's daughter, viz , Miss Jones, Aberbraint, Leicester

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Letters and Communications, &c.

Professor Gofton, Major Bishop, R A , Mr Chambers Professor O'Connor, Mr Townsend Mr Mayall, Mr I Bullock, Dr Rutherford Board of Agriculture and Fisheries, Department of Agriculture and Technical Instruction for Ireland

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Books and Periodicals, &c., Received.

Bulletin of the Bureau of Sleeping Sickness Report of the Director General of the A V C , Report of the Civil Veterinary Department of the Central Provinces, Agricultural Journal for Rhodesia, Agricultural Journal for Union of South Africa, Mr Merck's Annual Report, London University Gazette

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